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February 2, 2007

Mr. Jon Benallo
Vice President of Development
SouthWestern Investment Group, Inc.
333 West Hampden Avenue, Suite 810
Englewood, Colorado 80110

**RE: Summary Report of Preliminary Site Investigation Activities
Weld County, Colorado**

Dear Mr. Benallo:

This letter report summarizes the site investigation field activities recently performed by Tetra Tech at the Pratt Property in Weld County, Colorado (the Property). A summary of the proposed scope of the site investigation activities is listed below:

- Attempt to locate boring logs for the two existing monitoring wells (MW-1 West and East) on the Property and collect groundwater samples from each of the wells. Samples will be analyzed for the same suite of constituents included in the routine detection monitoring program conducted by DRLS.
- Install three gas monitoring points along the northern boundary of the Property adjacent to the Old Erie Landfill. These gas monitoring points will be installed using a Geoprobe drill rig and vapor samples collected from each location will be analyzed for methane and VOCs.
- Conduct further investigation into the location of the reported mud pits associated with the oil and gas wells. Global positioning system (gps) coordinates for the mud pit locations will be obtained from COGCC records and these locations will be field verified based on observations for residual drilling mud, petroleum hydrocarbons in the soil, or other visual evidence. Shallow borings will be advanced using a Geoprobe drill rig. Samples will be collected from the borings within the identifiable mud pits located on the Property and analyzed for TPH and other contaminants required by the COGCC for mud pit closure.

Attempts to locate the boring logs for the two existing monitoring wells were unsuccessful. There are no records of these wells on file with the State Engineer's Office, and Stewart Environmental, who reported analytical results from these wells in their Phase II Site Investigation Report from 1992 were unable to provide any well construction details or boring logs. Installation of the three soil vapor monitoring points was completed on January 11, 2007 and the sampling of soil vapor and groundwater was conducted on January 15 and 16, 2007. The former mud pit locations were not sampled due to deep snow drifts, which prevented access to these areas. Additional detail regarding the completed site investigation activities are provided below.

Summary of Completed Site Investigation Activities

Three soil vapor monitoring points were installed on January 11, 2007 along the northern property boundary, just south of the Old Erie Landfill. Their locations are shown on Figure 1 (attached). Site Services, Inc. of Golden Colorado was subcontracted to install the soil vapor monitoring points. A direct push GeoProbe rig was used to create two and a half inch borings. Each boring was continuous sampled, and boring logs with construction details for each vapor monitoring point are included in Attachment A. The soil vapor monitoring points were installed through the GeoProbe drilling rods. Three-eighths inch tubing was connected to a one-foot screened stainless steel soil vapor extraction point and extended to the surface. One and a half feet of sand was placed around the soil vapor point screen and the remaining boring was sealed with hydrated bentonite chips. The tubing is protected at the surface by a six-inch flush mounted protective cover. SV-1, the western point, was installed with a screened interval between 15.5 and 6.5 feet below ground surface (bgs). SV-2 was installed with a screened interval between 15.5 and 16.5 feet bgs. SV-3, the eastern point, was installed with a screened interval between 18 and 19 feet bgs. Prior to soil vapor sampling on January 16, 2007, the probe installations were allowed to equilibrate for four days. A SKC Universal PCXR4 personal air sampling pump was used to purge and sample each of the soil vapor points. The air sampling pump was calibrated in the field to a flow rate of 2-liters per minute using a traceable manometer. Purging of each soil vapor point was accomplished by connecting the pump intake directly to the 3/8-inch tubing extending to the surface from each soil vapor point. At each soil vapor point, 10 liters of soil vapor were purged prior to sample collection. After completion of each purge, a tedlar bag was connected directly to the air sampling pump exhaust using a dedicated piece of tygon tubing. Each soil vapor sample was contained in a ten liter tedlar bag, filled at a rate of 2 l/min. The three samples were shipped to Atmospheric Analysis & Consulting, Inc. for analysis. The soil vapor was analyzed for a landfill gas suite and volatile organic compounds from the EPA's AP-42 list. The laboratory data is presented in Table 1 and discussed below.

Groundwater samples were collected from the two existing monitoring wells on January 15, 2007. As indicated on Figure 1, these wells are located in the south-central portion of the site near the bottom of a swale running east to west through the Property. Prior to sample collection the water level and total depth was recorded. The western well, identified as MWV-1A has a total depth of 41.9 feet and the depth to water was measured at 18.50 feet below the top of the casing. The eastern well, identified as MWV-1B has a total depth of 79.7 feet and the depth to water was measured at 54.62 feet below the top of the casing. Disposable bailers were used to purge the wells of three well volumes prior to sample collection. Sample containers were placed on ice in a cooler and shipped to Pace Analytical Labs for analysis. The water generated from each well was clear and free of sheens and odors. Each sample was analyzed for Total Petroleum Hydrocarbons (TPH) and Total Volatile Organic Compounds (VOCs). The laboratory data is presented in Table 2 and discussed below.

Discussion of Preliminary Site Investigation Results

Analytical results from both the groundwater and soil vapor samples have been evaluated against risk-based screening levels developed in accordance with the *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway From Groundwater and Soils*, developed by the United States Environmental Protection Agency's Office of Solid Waste and Emergency Response (EPA, 2002). This document, referred to as the Subsurface Vapor Intrusion Guidance (SVIG) presents an approach to determining if there is a potential for an unacceptable risk associated with vapor intrusion. Vapor intrusion is defined as the migration of volatile chemicals from the subsurface into overlying buildings. Volatile chemicals in buried wastes and/or contaminated groundwater can emit vapors that may migrate through subsurface soils and into indoor air spaces in ways similar to that of radon gas seeping into homes (EPA, 2002). The Draft SVIG presents generic screening levels or target shallow gas or groundwater concentrations

for a long list of organic chemicals, which correspond to risk-based concentrations for indoor air in residential settings. These screening levels are calculated over a risk range of 1×10^{-4} (one in ten-thousand) to 1×10^{-6} (one in one million). A primary factor utilized in calculating the screening levels is the soil gas-to-indoor air, or groundwater-to-indoor air attenuation factors, or the anticipated amount of vapor which may migrate from the subsurface into indoor air spaces. Many site-specific conditions affect this migration pathway, the calculation of appropriate attenuation factors, the determination of whether a complete pathway exists and the evaluation of the potential risk associated with vapor intrusion. These conditions or factors include building characteristics, chemical type, soil type, and depth to the source (either in soil gas or groundwater). As this document is a guidance document, it does not impose any requirements or obligations and the screening levels developed through its use are not regulatory limits.

The analytical results for the soil vapor samples collected from SV-1, SV-2, and SV-3 are presented in the attached Table 1. This table also presents the Target Shallow Soil Gas Concentration, or screening levels, from the Draft SVIG based on a conservative soil gas-to-indoor air attenuation factor of 0.1 at a risk level of 1×10^{-6} (one in one million). This attenuation is considered appropriate for soils less than five feet below a foundation surface. As stated above, each of the soil vapor samples were collected from depths of less than 20 feet below ground surface. As indicated in Table 1, the observed soil vapor concentrations for 8 volatile organic compounds and hexane exceed the screening level values, with at least one exceedance in each of the three monitoring points. The observed concentrations of vinyl chloride, methylene chloride, trichloroethene (TCE) and tetrachloroethylene (PCE) in SV-3 all exceed the risk-based screening levels by a factor of more than 100 (TCE by nearly 20,000 and PCE by more than 2,000). Each of these constituents is a known or suspected carcinogen and the screening levels are based on the potential cancer risk associated with exposure to these chemicals. The maximum methane concentration observed occurred in SV-3, at 1.2% methane by volume. This is less than the lower explosive limit for methane of 5%, the threshold limit for methane gas at a landfill facility boundary. Based on these data, additional site specific information is necessary to fully characterize the nature and extent of potential contamination in this area of the site, to understand whether the site conditions represent a complete exposure pathway, and to fully characterize the potential risks.

The analytical results for the groundwater samples collected from MW-1A and MW-1B are presented in the attached Table 2. This table also presents the Federal Drinking Water Standards and Target Groundwater Concentrations, or screening levels, from the Draft SVIG based on a conservative, or relatively high, soil gas-to-indoor air attenuation factor of 0.001 at a risk level of 1×10^{-6} (one in one million). None of the petroleum hydrocarbon compounds or VOCs analyzed for in the groundwater samples were detected above the laboratory reporting limits presented in the table and none exceed the Federal Drinking Water Standards, or screening levels. However, it should be noted that the screening levels for TCE, PCE, vinyl chloride and other VOCs have been set equal to the Maximum Contaminant Levels (MCLs) identified in the Federal Drinking Water Standards, and may be subject to further review and modification.

Additional Site Characterization

Based on the results of the initial site investigation, presented above, and discussions with SouthWestern, additional investigation activities to further characterize the property have been considered. The objectives of an enhanced site investigation include: the investigation of the potential source and extent of VOCs in soil vapor in the northeastern portion of the property near the Old Erie landfill; a more complete evaluation of potential soil gas along the northern property boundary, south of Denver Regional Landfill South (DRLS); the collection of additional site characterization information relative to the evaluation of attenuation factors and potential exposure pathways; and the

characterization of groundwater quality throughout the property. To meet these objectives the following activities are proposed:

- Installation and sampling of five or six additional soil vapor monitoring points within the proposed 300-foot buffer along the northern boundary of the property;
- Re-sampling of the three recently installed vapor monitoring points (SV-1, SV-2, and SV-3);
- Installation and sampling of six to eight groundwater monitoring wells located throughout the property; and
- Conduct the originally proposed investigation of the former mud pit locations associated with the oil and gas wells.

The proposed locations of the additional monitoring points are illustrated on the attached Figure 2. The proposed soil vapor monitoring points are anticipated to be installed within the unsaturated soil zone above the weathered claystone bedrock, typically encountered at depths of 20 feet or less. The locations have been selected to further characterize and assist in defining the presence and extent of affected soil vapor south of the Old Erie Landfill and to assess the soil vapor quality immediately south of the DRLS, where the landfill's landfill gas monitoring wells are all completed within the claystone bedrock formation at depths ranging from 40 to 100 feet below ground surface. Field measurements of methane using a landfill gas detector will be made in the field following the installation of the vapor monitoring points. If these field observations reveal the presence of methane, or any other landfill gas indicators, additional vapor monitoring points may be installed in an attempt to define the limits of any affected soil vapor or gas migration. Very shallow (three to five feet) monitoring points are also being considered in the vicinity of SV-3 to evaluate vertical gradients and potential attenuation.

As documented through our review of landfill records available through the CDPHE, groundwater conditions in the area are somewhat complex. The existing groundwater monitoring network downgradient of the DRLS consists of four monitoring wells completed in the No. 6 coal seam which exists beneath the property, dipping to the southeast at a reported angle of 1.5 degrees. Groundwater may also occur in shallower isolated or perched zones of more permeable sand and sandstone lenses within the claystone bedrock of the Denver-Arapahoe formation. In reports for both the DRLS and the Front Range Landfill (FRL) to the east, it has been concluded that groundwater encountered in these shallow, perched systems are typically isolated and not likely to be continuous, or contiguous, across the site.

Groundwater monitoring results from the DRLS have not identified any "statistically significant" increases (see December 8, 2006 *Letter Report for Due Diligence Assessment*) of contaminants in the downgradient wells within the No. 6 coal 'aquifer'. Along the west side of the DRLS and throughout the FRL site, perched groundwater zones have been identified in the claystone formation above the No. 6 coal. As discussed previously, and in accordance with the EPA's Draft SVIG, vapor intrusion is typically a concern where the depth to groundwater is less than 100 feet. Therefore, the focus of the enhanced groundwater investigation will be to identify the occurrence of groundwater within the No. 6 coal 'aquifer', or shallower, perched aquifers to a maximum depth of 100 feet below ground surface. Depending on subsurface conditions encountered during drilling, monitoring well pairs (nested wells) may be installed at one location if multiple perched aquifers, or saturated zones, are encountered. It is anticipated that the No. 6 coal 'aquifer' may be encountered at depths of less than 100 feet in the western portion of the site, but in the eastern portion of the property this aquifer may be as deep or deeper than 175 feet, as the surface topography rises to the east and the aquifer appears to dip, or get deeper, to the east or southeast.

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If you have any questions regarding the discussion of results, or proposed scope of additional site investigation activities, please do not hesitate to contact me. It is our pleasure to be of continued service to SouthWestern in the evaluation of the Pratt Property.

Sincerely,

TETRA TECH



Daryl L. Longwell, P.E.
Senior Project Manager

Attachments

Table 1 – Soil Vapor Monitoring Results

Table 2 – Groundwater Monitoring Results

Figure 1 – Site Plan and Existing Monitoring Locations

Figure 2 – Proposed Enhanced Site Investigation Locations

Attachment A – Soil Boring Logs and Vapor Monitoring Point Construction Details

Table 1
Pratt Property, Weld County, CO
Soil Vapor Monitoring Results - January 16, 2007
SouthWestern Investment Group, Inc.

Compound	Target Shallow Soil Gas Concentration ⁽¹⁾ (ppbv)	SV-1 (West) Screened: 15-16 ft bgs (ppbv)	SV-2 Screened: 16.5-17.5 ft bgs (ppbv)	SV-3 (East) Screened: 18-19 ft bgs (ppbv)
Chlorodifluoromethane	140,000	20.2	<1 ⁽²⁾	1,170
Dichlorodifluoromethane	400	263	1.1	1,110
Chloromethane	12	<1	<1	<200
Vinyl Chloride	1.1	<1	<1	410
Chloroethane	38,000	<1	<1	589
Dichlorofluoromethane	-- ⁽³⁾	17.7	1.3	9,460
Ethanol	--	11.3	7.7	<400
Acetone	1,500	14	13.5	<400
Trichlorofluoromethane	1,200	5	<1	624
Isopropyl Alcohol	--	<1	<1	<400
Acrylonitrile	0.17	<1	<1	<200
1,1-Dichloroethylene	500	<1	<1	5,510
Methylene Chloride	15	2.9	1.3	6,270
Carbon Disulfide	2,200	<1	<1	<200
1,1,2-Dichloroethylene	--	<1	<1	<200
1,1-Dichloroethane	1,200	12.7	<1	3,580
2-Butanone (MEK)	3,400	2.3	1.1	<200
Hexane	570	3.7	2.7	<200
Chloroform	0.22	<1	<1	<200
1,2-Dichloroethane	0.23	<1	<1	<200
1,1,1-Trichloroethane	4,000	2.2	<1	2110
Benzene	0.98	1.5	<1	<200
Carbon Tetrachloride	0.26	<1	<1	<200
1,2-Dichloropropane	8.7	<1	<1	<200
Bromodichloromethane	0.21	<1	<1	<200
Trichloroethene (TCE)	0.041	1.3	<1	816
4-Methyl-2-Pentanone (MiBK)	200	<1	<1	<200
Toluene	1,100	10.5	2.8	<200
1,2-Dibromoethane	0.014	<1	<1	<200
Tetrachloroethylene (PCE)	1.2	3.7	1.4	2,870
Chlorobenzene	130	<1	<1	<200
Ethylbenzene	5.1	<1	<1	<200
m- & p-Xylenes	16,000	<1	<1	<200
1,1,2,2-Tetrachloroethane	0.061	<1	<1	<200
o-Xylene	16,000	<1	<1	<200
1,3-Dichlorobenzene	170	<1	<1	<200
1,4-Dichlorobenzene	1300	<1	<1	<200
1,2-Dichlorobenzene	330	<1	<1	<200

Table 1
Pratt Property, Weld County, CO
Soil Vapor Monitoring Results - January 16, 2007
SouthWestern Investment Group, Inc.

Compound, Units	Target Shallow Soil Gas Concentration ⁽¹⁾ (ppmv)	SV-1 Screened: 18-19 ft bgs (ppbv)	SV-2 Screened: 16.5-17.5 ft bgs (ppbv)	SV-3 Screened: 15-16 ft bgs (ppbv)
TRS ⁽⁴⁾ , ppmv	--	<0.01 ⁽⁵⁾	<0.01	0.01
Ethane, ppmv	--	<0.3	<0.3	<0.3
Propane, ppmv	--	<0.3	<0.3	3.7
Butane, ppmv	--	<0.3	<0.3	8
Pentane, ppmv	--	<0.3	<0.3	6.2
Hexane, ppmv	0.57	<0.3	<0.3	7.8
NMOC as Methane	--	3	2.7	120
Hydrogen Sulfide, ppmv	--	<0.01	<0.01	<0.01
Carbonyl Sulfide, ppmv	--	<0.01	<0.01	<0.01
Methyl Mercaptan, ppmv	--	<0.01	<0.01	<0.01
Carbon Disulfide, ppmv	2.2	<0.01	<0.01	0.01
Ethyl Mercaptan, ppmv	--	<0.01	<0.01	<0.01
Dimethyl Sulfide, ppmv	--	<0.01	<0.01	<0.01
Carbon Monoxide, %	--	<0.1 %	<0.1 %	<0.1 %
Oxygen, %	--	18.4	18.7	13.5
Nitrogen, %	--	81	81.2	73.5
Methane, % ⁽⁶⁾	--	<0.1 %	<0.1 %	1.2
Carbon Dioxide, %	--	0.5	<0.1 %	11.7

Notes:

(1) Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor = 0.1 (less than 5 ft below foundation surface) at a risk level of 1×10^{-6} (includes both carcinogenic and non-carcinogenic risk). Source: Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway From Groundwater and Soils (EPA, 2002).

(2) Values given as a < result indicate that the compound was not detected, and is less than the reporting limit concentration.

(3) No values are given for Target Indoor Air Concentrations where none were listed in the guidance document referenced above.

(4) Total Reduced Sulfur Compounds

(5) Result not detected at a value greater than the Practical Quantitation Limit

(6) Under RCRA Subtitle D, methane gas at a landfill facility boundary cannot exceed the lower explosive limit for methane, which is 5%

Table 2
Pratt Property, Weld County, CO
Groundwater Monitoring Results - January 15, 2007
SouthWestern Investment Group, Inc.

Compound	Federal Drinking Water Standards ⁽¹⁾ (MCL) (mg/L)	Target Groundwater Concentration ⁽²⁾ (mg/L)	MW-1A (mg/L)	MW-1B (mg/L)
Petroleum Hydrocarbons				
Diesel Fuel	-- ⁽³⁾	--	<0.4 ⁽⁴⁾	<0.4
Fuel Oil	--	--	<0.4	<0.4
Jet Fuel	--	--	<0.4	<0.4
Kerosene	--	--	<0.4	<0.4
Mineral Spirits	--	--	<0.4	<0.4
Motor Oil	--	--	<0.4	<0.4
Total Petroleum Hydrocarbons	--	--	<0.4	<0.4
Volatile Organic Compounds (VOCs)				
	ug/L	ug/L	ug/L	ug/L
Acetone	--	220,000	<10	<10
Benzene	5	5	<1	<1
Bromobenzene	--	--	<1	<1
Bromochloromethane	--	--	<1	<1
Bromodichloromethane	--	2.1	<1	<1
Bromoform	--	0.0083	<1	<1
Bromomethane	--	--	<1	<1
2-Butanone (MEK)	--	440,000	<10	<10
tert-Butyl Alcohol	--	--	<10	<10
n-Butylbenzene	--	260	<1	<1
sec-Butylbenzene	--	250	<1	<1
tert-Butylbenzene	--	290	<1	<1
Carbon disulfide	--	560	<5	<5
Carbon Tetrachloride	5	5	<1	<1
Chlorobenzene	100	390	<1	<1
Chloroethane	--	28,000	<1	<1
Chloroform	--	80	<1	<1
Chloromethane	--	7	<1	<1
2-Chlorotoluene	--	--	<1	<1
4-Chlorotoluene	--	--	<1	<1
1,2-Dibromo-3-chloropropane	0.2	33	<2.5	<2.5
Dibromochloromethane	60.0	3.2	<1	<1
1,2-Dibromoethane (EDB)	0.05	0.36	<1	<1
Dibromomethane	--	--	<1	<1
1,2-Dichlorobenzene	--	2,600	<1	<1
1,3-Dichlorobenzene	600	830	<1	<1
1,4-Dichlorobenzene	75	8,200	<1	<1
Dichlorodifluoromethane	--	14	<1	<1
1,1-Dichloroethane	--	2,200	<1	<1
1,2-Dichloroethane	5	5	<1	<1
1,2-Dichloroethene (Total)	--	--	<1	<1
1,1-Dichloroethene	7	190	<1	<1
cis-1,2-Dichloroethene	70	210	<1	<1
trans-1,2-Dichloroethene	100	--	<1	<1
1,2-Dichloropropane	5	35	<1	<1
1,3-Dichloropropane	--	--	<1	<1
2,2-Dichloropropane	--	--	<1	<1
1,1-Dichloropropene	--	--	<1	<1
cis-1,3-Dichloropropene	--	0.84	<1	<1
trans-1,3-Dichloropropene	--	0.84	<1	<1

Table 2
Pratt Property, Weld County, CO
Groundwater Monitoring Results - January 15, 2007
SouthWestern Investment Group, Inc.

Compound	Federal Drinking Water Standards ⁽¹⁾ (MCL) (mg/L)	Target Groundwater Concentration ⁽²⁾ (mg/L)	MW-1A (mg/L)	MW-1B (mg/L)
Ethylbenzene	700	700	<1	<1
Hexachloro-1,3-butadiene	--	0.33	<1	<1
2-Hexanone	--	--	<10	<10
Isopropylbenzene (Cumene)	--	8	<1	<1
p-Isopropyltoluene	--	--	<1	<1
Methylene chloride	--	6	<1	<1
4-Methyl-2-pentanone (MIBK)	--	14,000	<10	<10
Methyl-tert-butyl ether	--	120,000	<1	<1
Naphthalene	--	150	<10	<10
n-Propylbenzene	--	320	<1	<1
Styrene	100	8,900	<1	<1
1,1,1,2-Tetrachloroethane	--	3	<1	<1
1,1,2,2-Tetrachloroethane	--	3	<1	<1
Tetrachloroethene	5	5	<1	<1
Toluene	1,000	1,500	<1	<1
1,2,3-Trichlorobenzene	--	--	<1	<1
1,2,4-Trichlorobenzene	70	--	<1	<1
1,1,1-Trichloroethane	200	3,100	<1	<1
1,1,2-Trichloroethane	5	5	<1	<1
Trichloroethene	5	5	<1	<1
Trichlorofluoromethane	--	180	<1	<1
1,2,3-Trichloropropane	--	290	<2.5	<2.5
1,2,4-Trimethylbenzene	--	24	<1	<1
1,3,5-Trimethylbenzene	--	25	<1	<1
Vinyl Chloride	2	2	<1	<1
Xylene (Total)	10,000	22,000	<3.0	<3.0
Gasoline Range Organics	--	--	<500	<500

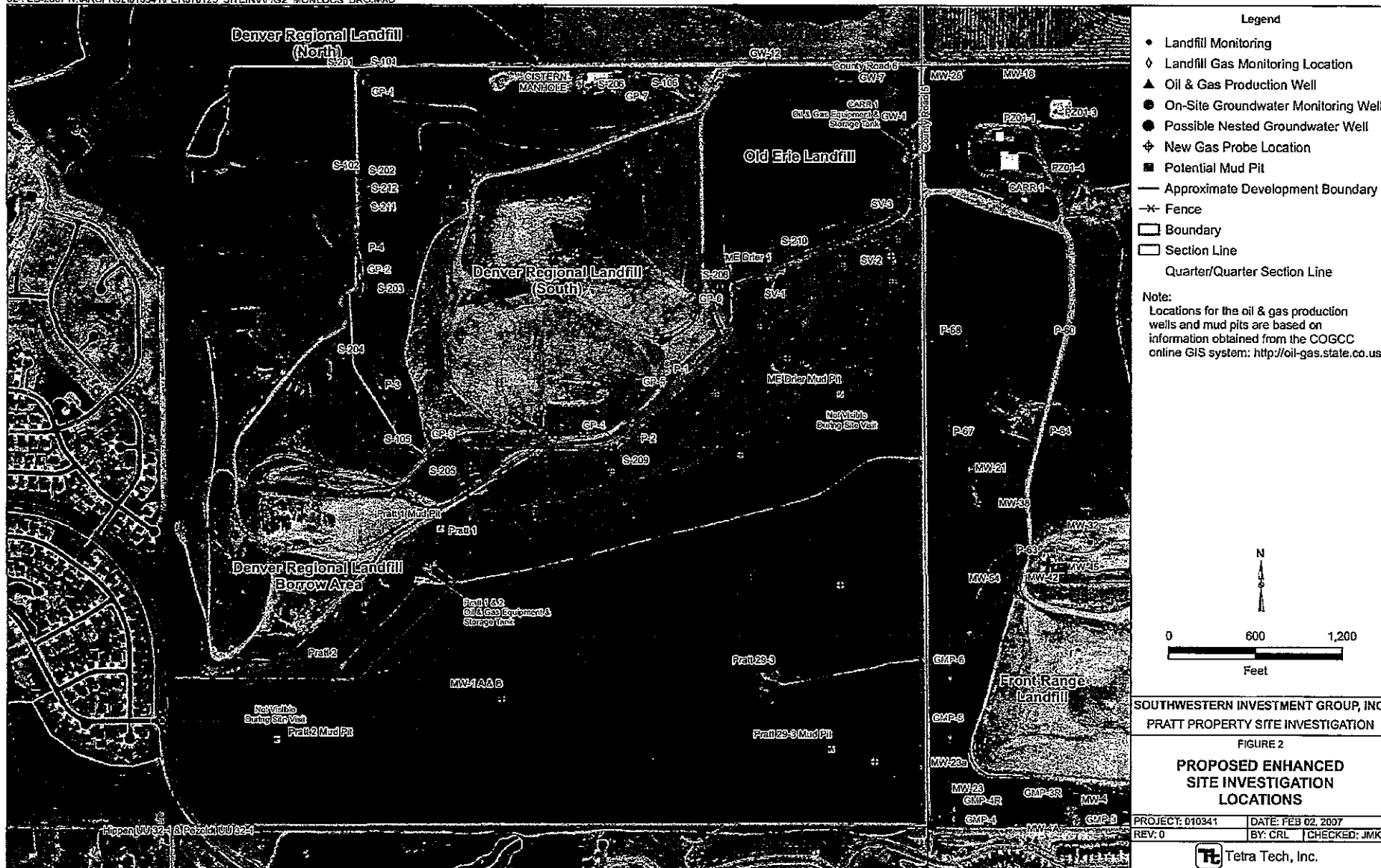
Notes: (1) Federal Drinking Water Standards; Maximum Contaminant Levels (MCLs) obtained from <http://www.epa.gov/safewater/contaminants/index.html>, accessed January 22, 2007.










(2) Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor = 0.001 and Partitioning Across the Water Table Obeys Henry's Law at a risk level of 1×10^{-6} . Source: Draft Guidance for Evaluating the Vapor Intrusion Indoor Air Pathway From Groundwater and Soils (EPA, 2002)

(3) No values are given for Federal Drinking Water Standards or Target Groundwater Concentrations

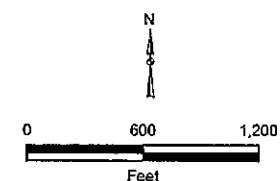
(4) Values given as a < result indicate that the compound was not detected, and is less than the reporting limit concentration.

(5) MW-1A DTW: 18.50 ft TD: 41.89 ft; MW-1B DTW: 54.62 ft TD: 79.740 ft



 Boundary
 Fence
 Section Line
 Quarter/Quarter Section Line
 Oil & Gas Production Well
 On-Site Groundwater Monitoring Well
 New Gas Probe Location
 Potential Mud Pit
 Landfill Monitoring
 Landfill Gas Monitoring Location

Note:
Locations for the oil & gas production wells and mud pits are based on information obtained from the COGCC online GIS system: <http://oil-gas.state.co.us>

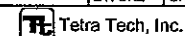


SOUTHWESTERN INVESTMENT GROUP, INC.
PRATT PROPERTY SITE INVESTIGATION

FIGURE 1

MONITORING LOCATIONS

PROJECT: 010341	DATE: JAN 25, 2007	
REV: 0	BY: CRL	CHECKED: JMK



Attachment A
Boring Logs and Vapor Monitoring Point Construction Details

Tetra Tech
Summary Report of Preliminary Site Investigation Activities
Pratt Property, Weld County, CO
February 2, 2007

TETRA TECH, INC

Log of Boring SV-1

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Erie Site Investigation
Project No. 010341.2
Erie, Colorado

Date Started : 1/11/07
Date Completed : 1/11/07
Boring Diameter : 2.5 inches
Drilling Method : Direct Push
Sampling Method : Continuous

Northing Coord. (m) : na
Easting Coord. (m) : na
Survey By : na
Logged By : Jim Kienholz

Surf. Elev. 0	DESCRIPTION	USCS	Water Level	Well ID: SV-1	Well Const. Information
0	Sandy CLAY, brown to gray, very stiff, medium plasticity, slightly moist, no stain, no odor	CL		Protective Casing	The soil vapor points were installed through the GeoProbe drilling rods. 3/8" poly tubing was connected to a 1 ft stainless steel soil vapor extraction point. 1.5 ft of sand was placed around the soil vapor point screen and the rest of the boring was sealed with hydrated bentonite chips. The tubing is protected at the surface by a six-inch flush mounted protective cover.
5	Silty CLAY, light brown, very stiff, medium plasticity, slightly moist, light iron stain, no odor	CL		Sand	
10	SILTY CLAY, dark brown to gray, very stiff, medium plasticity, iron staining, no odor	CL		3/8 poly tubing	
15	Sandy CLAY w/ Silt, light grey, stiff, medium plasticity, slightly moist, no stain, no odor	CL		Bentonite Seal	
16.5	Refusal			Sand	
20	Total Depth: 16.5 ft bgs			Soil Vapor Screen	
25					

TETRA TECH, INC

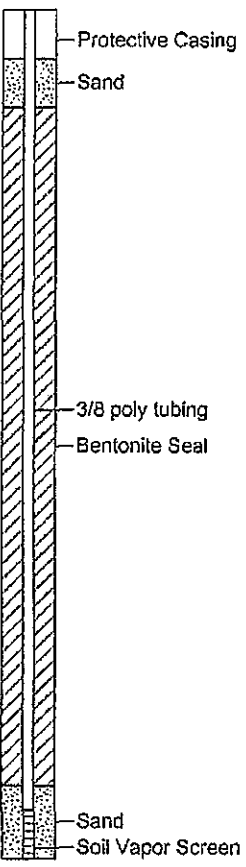
Log of Boring SV-2

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Erie Site Investigation
Project No. 010341.2
Erie, Colorado

Date Started : 1/11/07
Date Completed : 1/11/07
Boring Diameter : 2.5 inches
Drilling Method : Direct Push
Sampling Method : Continuous

Northing Coord. (m) : na
Easting Coord. (m) : na
Survey By : na
Logged By : April Tumey

Surf. Elev.	DESCRIPTION	USCS	Water Level	Well ID: SV-2	Well Const. Information
0	Sandy SILT, light brown, medium dense, dry, no stain, no odor	ML		 <p>Protective Casing</p> <p>Sand</p> <p>3/8 poly tubing</p> <p>Bentonite Seal</p> <p>Sand</p> <p>Soil Vapor Screen</p>	<p>The soil vapor points were installed through the GeoProbe drilling rods. 3/8" poly tubing was connected to a 1 ft stainless steel soil vapor extraction point. 1.5 ft of sand was placed around the soil vapor point screen and the rest of the boring was sealed with hydrated bentonite chips. The tubing is protected at the surface by a six-inch flush mounted protective cover.</p>
5	Sandy CLAY, brown to gray, very stiff, medium plasticity, light iron staining, no odor	CL			
10	No Recovery				
15	CLAY, grey to brown, very stiff, plastic, slightly moist, light iron staining, no odor.	CL			
	SAND lense, brown, dense, dry, no stain, no odor	SP			
	CLAY, brown, very stiff, medium plasticity, dry, no stain, no odor	CL			
	Total Depth: 18.0 ft bgs				
20					
25					

TETRA TECH, INC

Log of Boring SV-3

(Page 1 of 1)

Erie Site Investigation
Project No. 010341.2
Erie, Colorado

Date Started : 1/11/07
Date Completed : 1/11/07
Boring Diameter : 2.5 inches
Drilling Method : Direct Push
Sampling Method : Continuous

Northing Coord. (m) : na
Easting Coord. (m) : na
Survey By : na
Logged By : April Turney

Surf. Elev.	DESCRIPTION	USCS	Water Level	Well ID: SV-3	Well Const. Information
0	Sandy SILT w/ Clay, brown, dense, dry, no stain, no odor	ML		Protective Casing	The soil vapor points were installed through the GeoProbe drilling rods. 3/8" poly tubing was connected to a 1 ft stainless steel soil vapor extraction point. 1.5 ft of sand was placed around the soil vapor point screen and the rest of the boring was sealed with hydrated bentonite chips. The tubing is protected at the surface by a six-inch flush mounted protective cover.
5	Sandy CLAY, brown to grey, very stiff, medium plasticity, no stain, no odor	CL		Sand	
10	Sandy CLAY, grey, very stiff, medium plasticity, slightly moist, some iron staining, no odor	CL		3/8 poly tubing	
15	CLAY w/ Sand, gray, stiff, plastic, slightly moist, light iron staining, no odor	CL		Bentonite Seal	
20	Sandy CLAY, gray, very stiff, plastic, trace of moisture, no stain, no odor	CL		Sand	
25	Total Depth: 20 ft bgs			Soil Vapor Screen	

January 22, 2015

Ms. Susan Pratt, President
Pratt Partnership
105 South Sunset Street, Suite H
PO Box 1937
Longmont, CO 80502

Subject: Old Erie Landfill

Dear Ms. Pratt,

Stewart Environmental Consultants, LLC, was retained by Pratt Partnership to investigate and the close the "Old Erie Landfill", which is located in Weld County next to the currently operating Erie Landfill. We have investigated this site on numerous occasions. Originally, we investigated this site when there were reports of IBM disposing of barrels of waste along with magnetic tape from Storage Technology Company.

We have never found any indication of drums on this site. There have been numerous borings on the site along with groundwater wells. Originally, in the mid 1990's there was a one-time hit of a volatile organic compound, but this was never able to find this contamination and it was below groundwater standards set by the Colorado Department of Public Health and Environment (CDPHE). As a result of these discussions, we approached CDPHE for closure on this site through the Solid Waste Division. This was granted several years ago. If you need a copy of this correspondence, we will obtain this for you from CDPHE.

I believe you have been asked about this site being a Superfund site. This site has never been listed or even contemplated as a Superfund site. Superfund is a program under the US Environmental Protection Agency and would require significant known contamination of natural resources to be listed. This site has never been listed as a superfund site.

I hope that this information is helpful. There is not any indication of an environmental issue at this site from the Old Erie Landfill.

Sincerely,

Stewart Environmental Consultants, LLC



David R. Stewart, PhD, PE
President



SW/WLD/1.2A 6

DEPARTMENT OF HEALTH
1517 16TH AVENUE COURT
GREELEY, CO 80631

ADMINISTRATION (970) 353-0586
HEALTH PROTECTION (970) 353-0635
COMMUNITY HEALTH (970) 353-0639
FAX (970) 356-4966

July 2, 1998

Shawn McCash
Allied Waste Industries, Inc.
15880 N. Greenway/Hayden Loop, Suite 100
Scottsdale, Arizona 85260



RE: Old Erie Landfill, Post Closure Care Obligation

Dear Mr. McCash:

The Weld County Health Department (WCHD) has reviewed your May 26, 1998, letter concerning the final inspection and end of the post-closure care obligation for the Old Erie Landfill, Weld County. Enclosed with this letter was a copy of the final inspection report of the site. The inspection report was completed by Doty & Associates.

We have reviewed the approved closure plan prepared by Industrial Compliance, Inc., dated March 28, 1988, and the September 19, 1988, letter from Steve Orzynski of the Colorado Department of Public Health and Environment (CDPHE). In addition, on June 25, 1998, Roger Doak of the CDPHE and I observed the site.

Based upon review of the above pertinent documents and observation of the site, we concur that all required obligations have been satisfied and that the post-closure care and maintenance of the Old Erie Landfill has been fulfilled. As stated in your letter, the Denver Regional Landfill is required to monitoring groundwater at the Old Erie Landfill through the active life of that site.

Please do not hesitate to call me if you have any questions, or if I can be of any assistance. I can be reached at (970) 353-0635, extension 2232.

Sincerely,

Trevor Jiricek
Supervisor
Environmental Protection Services

tj\1048

cc: Roger Doak, Colorado Department of Public Health and Environment
Ben Doty, Doty and Associates

STATE OF COLORADO

Roy Romer, Governor
Patti Shwayder, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION

<http://www.cdphe.state.co.us/hm/>

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-3300
Fax (303) 759-5355

222 S. 6th Street, Room 232
Grand Junction, Colorado 81501-2768
Phone (970) 248-7164
Fax (970) 248-7198



Colorado Department
of Public Health
and Environment

July 2, 1998

Shawn McCash
Allied Waste Industries, Inc.
15880 N. Greenway/Hayden Loop, Suite 100
Scottsdale, AZ 85260

RE: Post Closure Care Obligation
Old Erie Landfill - Weld County, Colorado

Dear Mr. McCash:

The Solid Waste Unit of the Hazardous Materials and Waste Management Division (the Division) has reviewed your letter of May 26, 1998, notifying the Division that the ten-year obligation for post-closure care and maintenance of the Old Erie Landfill (a.k.a. the Pratt Property) has been fulfilled. Attached to your letter is a copy of the final site inspection report, dated February 23, 1998. The site inspection was completed by Doty & Associates on February 20, 1998.

On June 25, 1998 Trevor Jiricek of Weld County and I conducted a site visit to observe the condition of the final cover, subsidence monuments, and methane venting system. In addition, the facility's closure plan (March 28, 1988 Industrial Compliance, Inc.) and the September 19, 1988 approval letter from the Division were reviewed for applicable post-closure commitments.

Based on the review of the above relevant documents and observations from the site visit, we agree that all required obligations have been achieved and the post-closure care and maintenance of the Old Erie Landfill have been fulfilled. As stated in your letter, groundwater monitoring at the Erie Landfill will continue through the active life of the Denver Regional Landfill.

Should you have questions regarding this matter, please contact me at (303) 692-3437.

Sincerely,

Roger Doak
Solid Waste Unit
Compliance Program

cc: Weld County Board of Commissioners
Trevor Jiricek, Weld County Health Department
Ben Doty, Doty & Associates

sw/wld/par 6

MINE SUBSIDENCE INVESTIGATION

Pratt Property, Approximately 330 Acres in Section 29,
Township 1 North, Range 68 West,
Erie, Colorado



Prepared For:

LAI Design Group

88 Inverness Circle East, Suite J101
Englewood, Colorado 80112

WESTERN ENVIRONMENT AND ECOLOGY, INC.

2217 West Powers Avenue
Littleton, Colorado 80210
phone (303) 730-3452
fax (303) 730-3461
www.westernenvironment.com

MINE SUBSIDENCE INVESTIGATION

Pratt Property, Approximately 330 Acres in Section 29,
Township 1 North, Range 68 West,
Erie, Colorado

Prepared For:

LAI Design Group
88 Inverness Circle East, Suite J101
Englewood, Colorado 80112

Project Number 655-001-01

September 19, 2014

Prepared By:

Greg D. Sherman, P.G.
President

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APPENDICES:

Appendix A	Architectural Techniques to Reduce Subsidence
Appendix B	Lithologic Descriptions and Caliper Data Sheets

1.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of the preliminary investigation completed on the property consisting of approximately 330 acres in Section 29, Township 1 North, Range 68 West, Erie, Colorado, Western Environment and Ecology, Inc. (Western Environment) presents the following:

- The average “theoretical void” encountered beneath the property was 0.8 feet.
- The top of the “main” seam ranged from 267 to 309 feet below the surface. However, using the results of subsidence investigations on adjacent projects, a conservative average depth to the top of the main seam of **272 feet** was used.

Using these conclusions, the following general subsidence related recommendations for development are presented.

- Areas shown of Figure 2 as not being undermined have no mine subsidence related development restrictions.
- The theoretical “worst case” strains identified for the project will allow construction of buildings or building segments of **115 feet in maximum length**.
- Structures should be limited to two stories and be constructed using wood or metal framing.
- Utility installations should take into account the potential for **0.17%** strains above mine workings.
- Larger structures may be built if additional studies are conducted.

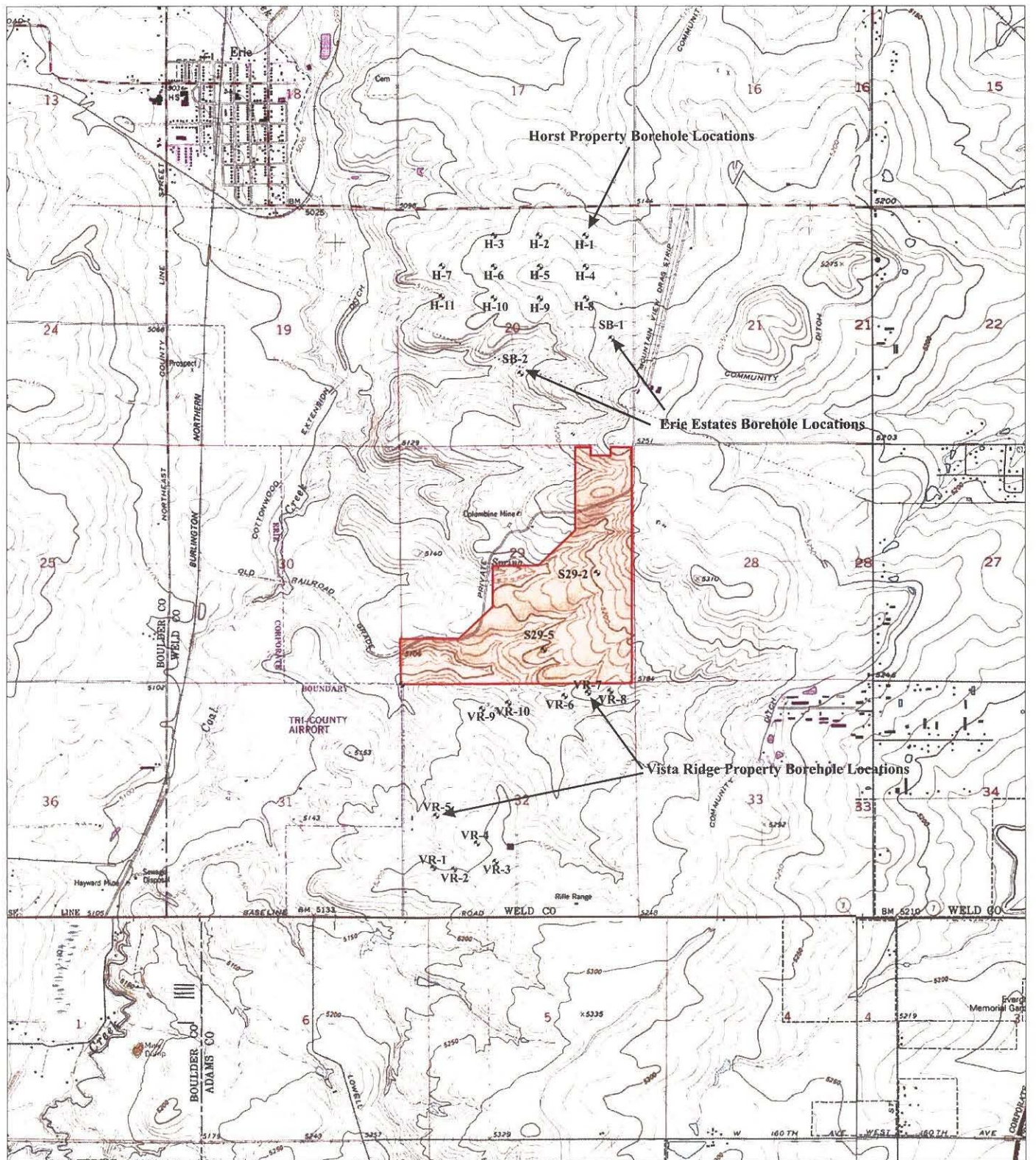
2.0 INTRODUCTION

Western Environment & Ecology, Inc. was retained by Mr. Josh Rowland of LAI Design Group to conduct a mine subsidence investigation of approximately 330 acres in Section 29, Township 1 North, Range 68 West, Weld County, Colorado (Figure 1). This site is referred to as the Pratt Property.

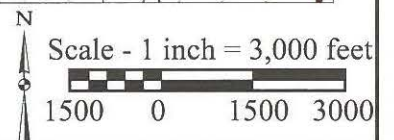
The purpose of this investigation is to evaluate the subsidence potential and condition of the Columbine Mine, and evaluate "theoretical" surface strains from a theoretical "worst case" subsidence event. Additionally, recommendations for subsidence resistant construction procedures and techniques are given.

Western Environment has completed a previous mine subsidence investigation on the Pratt Property for Southwest Investment Group (Project Number 445-001-01) dated November 16, 2006. Additionally, several Western Environment studies on adjacent properties to the north and south have been performed. These investigations were presented in reports entitled *Mine Subsidence Investigation Erie Estates Subdivision, Southwest 1/4 Section 20, Township 1 North, Range 68 West*, dated May 29, 2008; *Mine Subsidence Investigation, Horst Property*, dated April 4, 2000; and *Mine Subsidence Investigation, Vista Ridge Development*, dated March 1, 2001. Data acquired from these studies were utilized to evaluate subsidence induced surface strains. The results of all the assessments have been previously submitted to the Colorado Geological Survey for review, and therefore are public information.

The results and recommendations contained within this report are intended for use as an aid in planning and design. The information herein must be made available to the project geotechnical and structural engineers. Additionally, this, and all subsequent subsidence reports, should accompany the site development plan when submitted to the Town of Erie. The Town will request that the Colorado Geological Survey review and comment on this subsidence investigation. Following these procedures will aid in assuring a more predictable and thus economic development process.



✱ VR-1 Borehole Locations



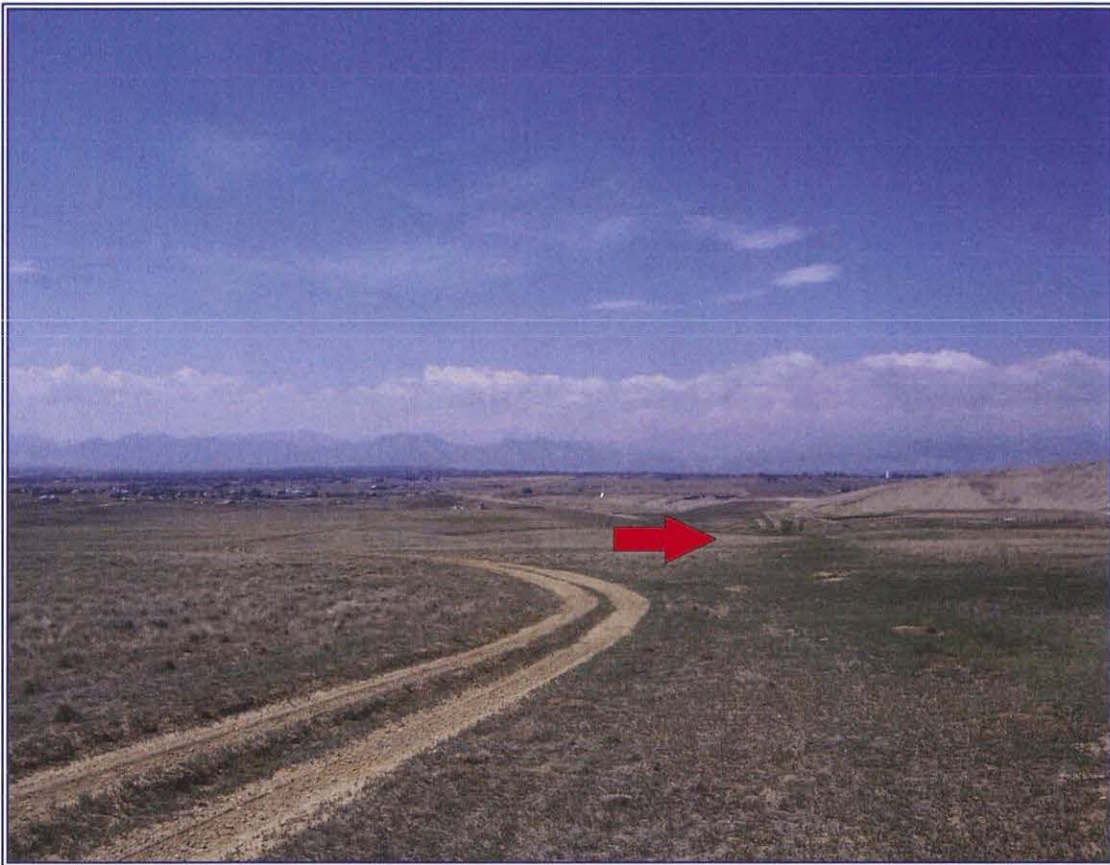
**WESTERN ENVIRONMENT
AND ECOLOGY, INC.**
2217 West Powers Avenue
Littleton, Colorado 80120

Figure 1 - Site Location Map
Approximately 330 Acres in Section 29,
Township 1 North, Range 68 West,
Erie, Colorado

3.0 SITE CHARACTERISTICS

This mine subsidence investigation was conducted for 330 acres in Section 29, Township 1 North, Range 68 West, in Weld County, Colorado. At the time of the inspection, the site was vacant. The property abuts two active landfills, and encompasses the closed Old Erie Landfill. The Pratt Property occurs southwest of the intersection of Weld County Roads (WCR) 5 and 6 (Figure 2). The site slopes gently to moderately to the west, and ranges from 5,090 to 5,260 feet (USGS Erie 7.5 Minute Quadrangle, 1979).

The abandoned coal mine that underlies the project is referenced in the files of the Colorado Geological Survey as the Columbine Mine. A detailed description of the mine is presented in Section 4.0.



View to the west from onsite, arrow shows approximate location of Serene Townsite



- Western Environment and Ecology, Inc. Boring location

Mine Map from the Colorado Geological Survey, Columbine Mine

Western environment
and ecology, inc.
2217 West Powers Avenue
Littleton, Colorado 80120

Figure 2 -Borehole Location Map
Showing Columbine Mine
Approximately 330 Acres in Section 29,
Township 1 North, Range 68 West,
Eire County, Colorado

4.0 COAL MINE DESCRIPTION

The mine which operated below the Pratt property is the Columbine Mine. The Columbine Mine and its owner, Josephine Roche, have an important role in Colorado history. The "Columbine Mine Massacre" occurred in 1927 when striking coal miners were attacked by Colorado State Police. The strike was a nationwide work stoppage called by the Industrial Workers of the World (the precursor of the Communist Workers Party). The company town of Serene, located near the center of Section 29, was the site of the Columbine Mine. Strikers had been conducting morning rallies at Serene for two weeks because the Columbine was one of the few coal mines in the state to remain in operation using management and non-striking employees. On November 21, 1927, five hundred miners, some accompanied by their wives and children, arrived at the north gate just before dawn. The miners were surprised to see men dressed in civilian clothes and armed with automatic weapons. After verbal alterations escalated into violence, six miners lay dead or dying.

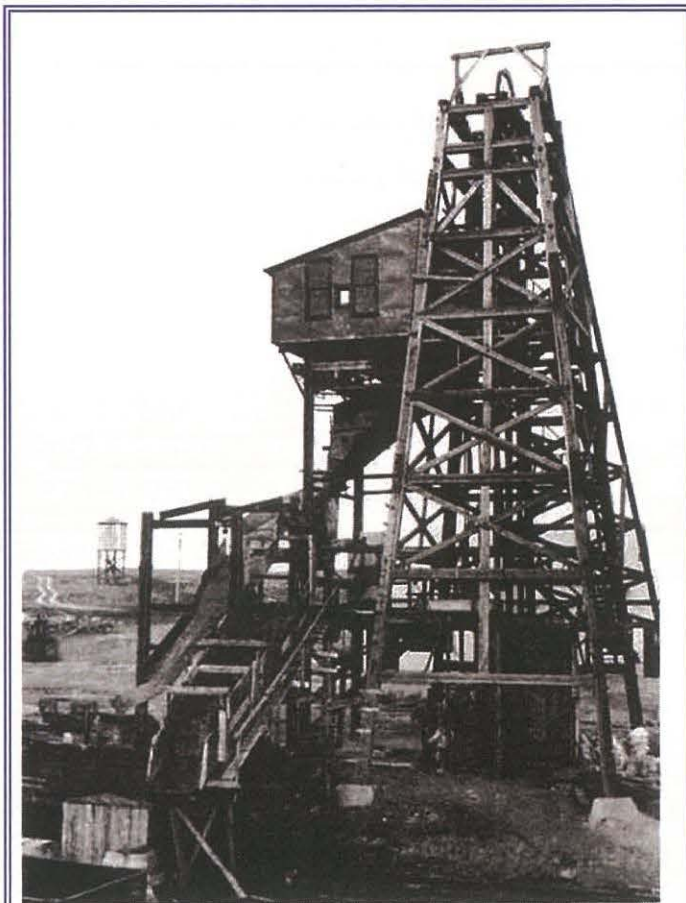
After the death of her father John Roche in 1927, Ms. Josephine Roche gained control of Rocky Mountain Fuel Company in 1929 and instituted a labor policy that allowed the Columbine Mine to be the first United Mine Workers mine in Colorado. She was highly regarded by the miners, obtaining a loan to make sure the striking miners were paid during work stoppage. Later, Ms. Roche was named Assistant Secretary of the Treasury by Franklin Roosevelt during his first term as President.



**Crowd gathers outside doctors office after shootings,
1927**

Records from the Colorado Division of Mines and the Colorado Geologic Survey show the "Columbine" Mine began operation in 1920 and continued until 1946. Total production from all operations was placed at 7,216,286 tons. Entry to the mine was gained via a 300 foot deep, two compartment production shaft located north of the Pratt Property, beneath the currently operating Denver Regional Landfill South. The Columbine mine maps indicate that only one level of mining occurs in Section 29. Elevation description on the maps and drilling indicate that the levels were separated by twenty to thirty feet.

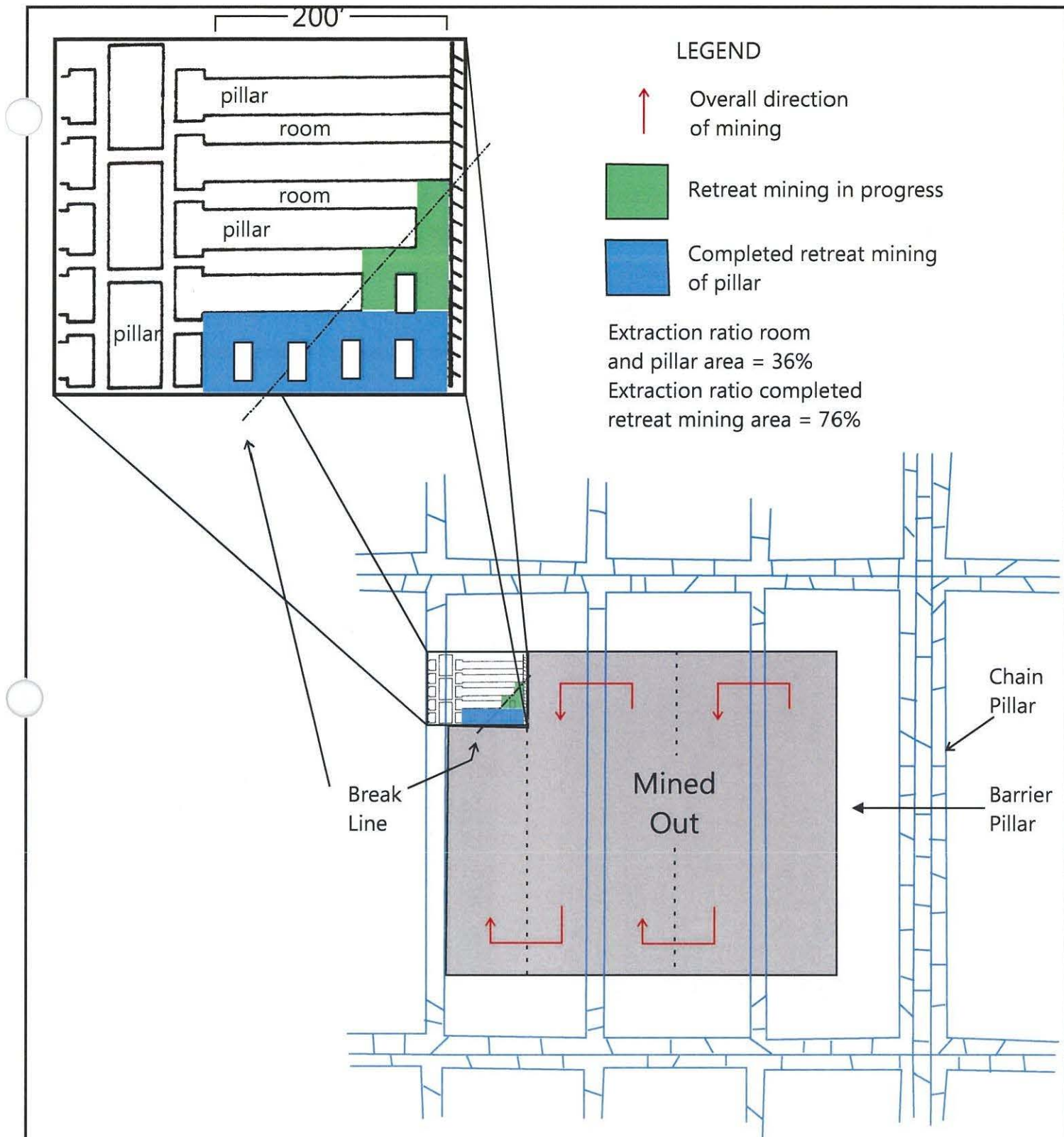
The Columbine Mine operation was classified as a modified room and pillar mine (Figure 3). The "pillar retreat" method was utilized during the early years of operation. Haulage ways were ten feet wide and were separated by 30 foot wide "chain pillars". Rooms had approximate widths of fifteen feet and lengths of 200 feet. The Columbine Mine was among the largest in the Boulder/Weld Coal Field. However, it differs somewhat from the other large mines in the district in that it was one of the first to utilize the continuous mining machine. This equipment / technique radically changed coal mining after its wide spread use in the early 1950's. However, review of the original mine map of the Columbine Mine indicate that from approximately 1940 through 1946, when the mine closed, a continuous



Tippie at Columbine Mine, Erie

ROCKY MOUNTAIN FUEL CO. OPERATED COLUMBINE MINE FROM 1920 UNTIL IT WAS CLOSED IN 1946. THE MINE WAS LOCATED SOUTH OF ERIE AND THE MINE CAMP OF SERENE WAS CLOSE BY FOR HOUSING FOR THE MINERS. 7,316,275 TONS OF COAL WERE PRODUCED AT THE MINE.

Photo from Louisville Public Library and Louisville Historical Museum



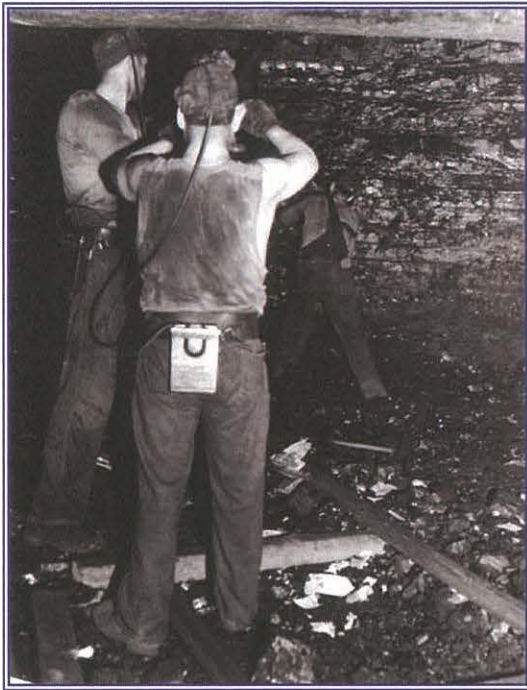
Literature Cited: Gray, Richard E. and Robert W. Bruhm, Coal Mine Subsidence - Eastern United States. Geological Society of America, Volume VI, 1984. And Tomlinson, H., "A Study of Falls of Roof and Coal In Northern Colorado", Dept. of Commerce, U.S. Bureau of Mines, Report of Investigations 3199, Jan., 1933.

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AND ECOLOGY, INC.**

2217 West Powers Avenue
Littleton, Colorado 80120

Figure 3 - Pillar Retreat Method for Coal Mining,
Approximately 330 Acres in Section 29,
Township 1 North, Range 68 West,
Erie, Colorado

mining operation was occurring in the northeast portions of the mine. Western Environment has determined that coal extraction rates increased from 50-60% in the older (pillar retreat) mines, to 60-70% or greater in the mines operating after introduction of the continuous miner. This increase in extraction resulted in a reduction in overall roof support, which in turn produced more complete and thorough subsidence in the newer mines. Western Environment calculated, that given similar depth, mine layout, and seam thickness, "theoretical" surface strains could be 30% higher in the older mines.



Workers in Columbine Mine. Photo from the Denver Public Library, Western History Collection

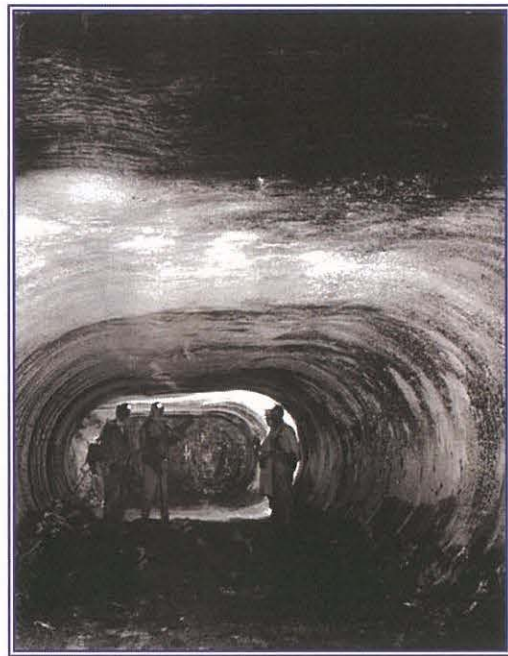


Photo of Room Mined Using Continuous Miner

Western Environment has researched the mining methods utilized in the Boulder/Weld mines. In the report entitled "A Study of Falls of Roof and Coal in Northern Colorado" Tomlinson (1933) describes the mining method used in five operating mines "*The room and pillar and panel methods of mining are employed. Pairs of room entries are advanced to a predetermined point, and rooms in sets of two to four are turned from one room entry or in some places from both entries. Room pillars are recovered immediately after the rooms have been advanced for the required distance, and a uniform break line maintained with each group of retreating pillars.*" This method of retreat mining is illustrated on Figure 3.



Starting The Cross Cut

5.0 DRILLING PROCEDURES

Two rotary holes were drilled on the Pratt Property for the previous Southwest Investment investigation by Plains Water Well Service, Inc. of Cheyenne, Wyoming. All holes were both lithologically and geophysically logged. Lithologic strip logs (Appendix A) were taken of cutting samples at five foot intervals. Geophysical logs consisting of natural gamma, spontaneous potential (SP), resistance and a three arm caliper were run selected holes intercepting the mine workings (Appendix B).

The caliper tool was calibrated prior to each use to graphically show the diameter of the hole. The full extension of the arms would indicate a cavity of at least greater than 21 inches. The drill will normally make a 5.125 inch or 6.25 inch hole. Therefore, a significantly larger or smaller hole could indicate mining activity.

After drilling and logging, each hole required plugging in a manner which would not allow water to enter the workings. On all holes, a simple cement plug was set from 2 to 15 feet with the remaining footage of the hole being filled with Colorado State Mined Land Reclamation Board approved abandonment fluid which is designed to inhibit fluid penetration. Native soil was then replaced from 2 feet to the surface.



Rotary Drill Pratt Property

6.0 REGIONAL GEOLOGY

6.1 Outcropping Units

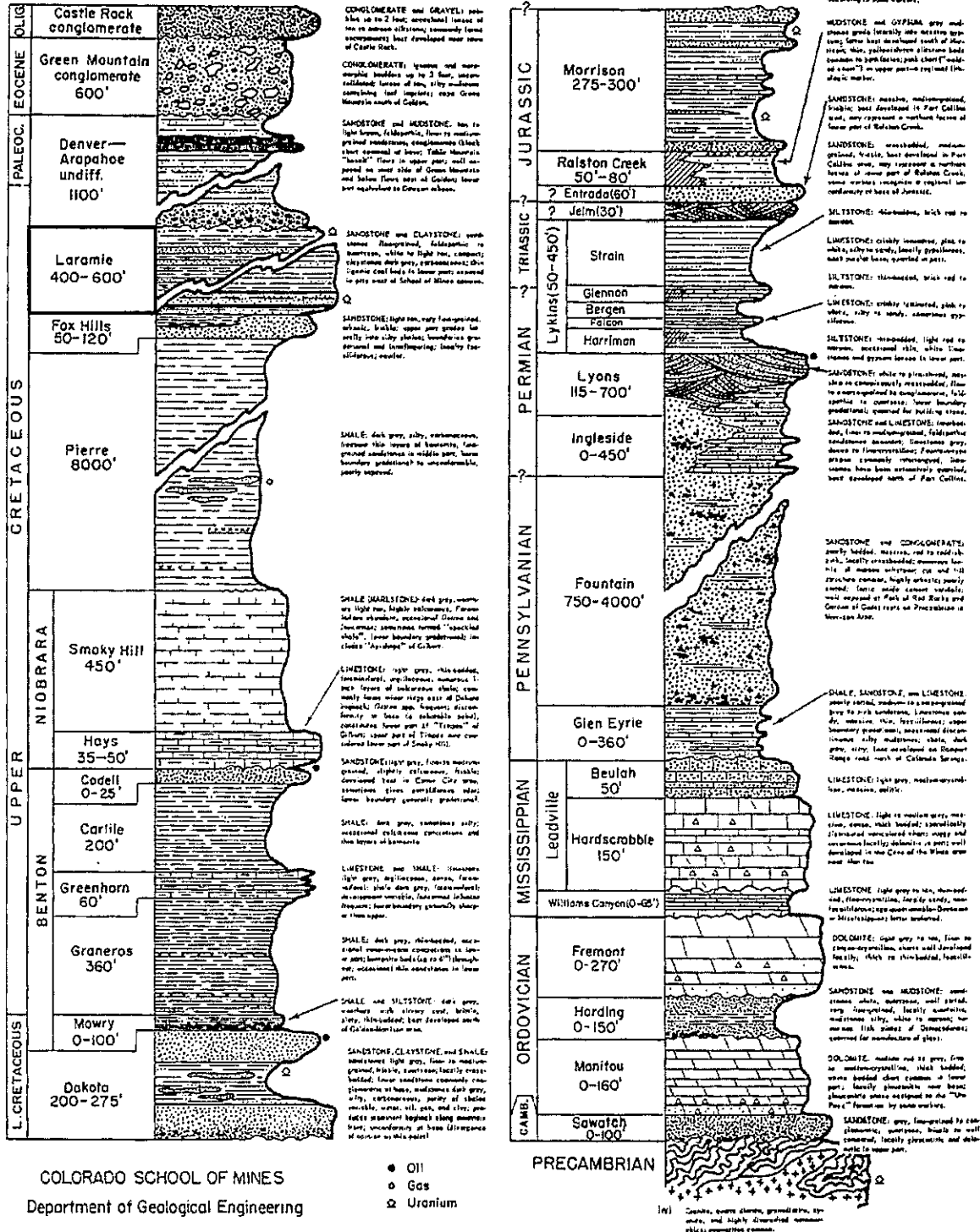
Outcropping units within and surrounding the Erie area are the Pierre Shale, the Fox Hills Sandstone, the Laramie Formation and Quaternary gravels and soils (Figure 4).

The Pierre Shale is a lead gray to brown and black shale of marine origin. Total thickness in the area is greater than 7,000 feet (Blair 1951), with the majority of the formation made up of shale. Near the top of the Pierre Shale it becomes increasingly sandy and contains beds of fine sandstones and siltstones as it grades into the Fox Hills Sandstone. This unit does not outcrop on the site but can be seen southeast of the project on the east side of the Town of Erie.

The Fox Hills Sandstone is a massive to crossbedded sandstone. It was deposited in a beach and/or delta-front environment and comfortably overlies the Pierre Shale. The lower two-thirds of the formation is a fine to coarse grained, bluff colored sandstone which weathers to a light tan to tan color. The Fox Hills Sandstone contains numerous iron colored calcareous concretions, ranging in size from fractions of an inch to several feet. The upper one-third of the Fox Hills Sandstone is a fine to medium grained, light gray to pale yellow in color, crossbedded sandstone. The total thickness of the formation near this location is about 140 feet as measured in the NW 1/4 of Section 28, T1S, R70W. Thickness varies from 60 feet near Ralston Creek (Van Horn, 1957) to 250 feet near Baseline Reservoir.

The Laramie Formation, which directly underlies the site is predominantly a fresh water deltaic sequence, consisting of clays, sands, silts and coals (Figure 5). The lower portion is approximately 100 feet thick and is composed of sandstones, sandy shales, claystones, and coal beds. These coals have been economically mined in the past. The upper unit has a thickness of approximately 600 feet and is made up of mostly clay shales, very fine sandy shales, and lenticular beds of sandstone. The shales are largely carbonaceous and in places becomes lignitic. The Laramie Formation lies comfortably on the Fox Hills Sandstone.

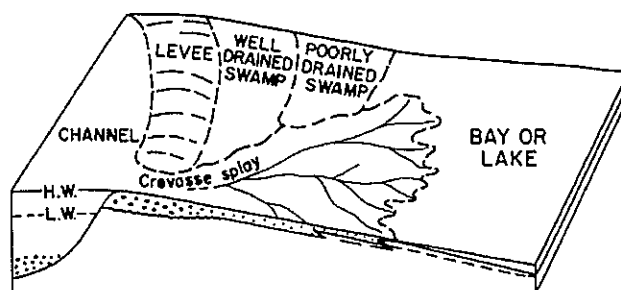
GENERALIZED COMPOSITE
STRATIGRAPHIC SECTION
FRONT RANGE OF COLORADO



COLORADO SCHOOL OF MINES
Department of Geological Engineering

**WESTERN ENVIRONMENT
AND ECOLOGY, INC.**
2217 West Powers Avenue
Littleton, Colorado 80120

Figure 4 - Generalized Stratigraphic Section,
Approximately 330 Acres in Section 29,
Township 1 North, Range 68 West,
Weld County, Colorado



Channel and channel margin environments for lithologies in Laramie Formation.

Relationship of channel margin environments to crevasse splay deltas.

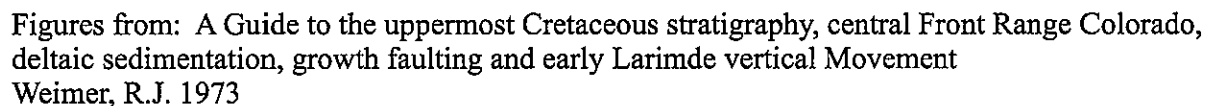
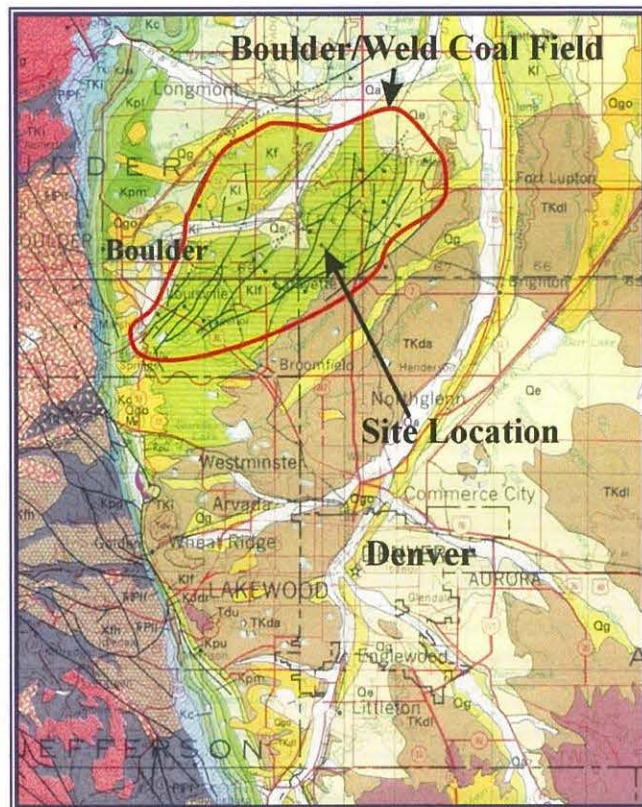


Figure 5 - Generalized Stratigraphic Models of the Laramie Formation, Approximately 330 Acres in Section 29, Township 1 North, Range 68 West, Erie, Colorado

6.2 Structure

The subject property lies on the western edge of the Denver-Julesberg Basin against the Front Range Uplift. This basin contains up to 13,000 feet of sediments derived from the ancestral Rockies which laid to the west. Two kinds of faulting occur in this portion of the basin. A basement-controlled late Cretaceous Laramide faulting is the most prevalent and is the result of deformation associated with uplift. The second basin has been described by Davis and Weimer (1976) as growth-faulting as a result of differential loading of the deltaic sequence at the time of deposition.

Growth faulting is the major structural feature seen in the area. A zone is present with dominant faults trending in a northeasterly direction. This system is ten miles wide and thirty miles long. These faults are high-angle, normal structures near the surface, but seismic work has shown that they tend to flatten and die out at depth. Work by Davis and Weimer (1976) shows that these listric normal faults do not continue below the Hygiene Member of the Pierre Shale. Antithetic faults resulting from tension then form horst and grabens. This effect had resulted in the increased thickness of sediments in the graben areas. The Fox Hills Sandstone has been reported to have a thickness near a growth fault of 484 feet (Spencer, 1961). The Laramie Formation also has increased thickness in these zones and this is believed to be the reason for the increased thickness of the coal seams in the Boulder-Weld coal field.



Front Range geology, from Tweto, 1979

7.0 SITE GEOLOGY

Two distinct units were encountered during drilling on the Pratt Property. The first unit penetrated was a sandy clay occurring from 0 to 15 feet in depth. This unit appears to be aeolian (wind deposited) in occurrence. Western Environment's experience with the geotechnical properties of the unit has shown that, although high swell potentials are unlikely, collapsing upon saturation can occur with aeolian soils.

The next unit that had a transitional boundary between soil, weathered rock, and fresh rock was the interbedded clays, silts, fine-grained sand, and coals of the Cretaceous Age Laramie Formation. This formation extended from approximately 10 to 15 feet beneath the surface to greater than 380 feet.

At least six coals have been identified during drilling on the subject property. However, no attempt to correlate the coals was made. The "main" seam of the Columbine Mine occurred at a depth ranging from approximately 267 to 307 feet in the borings advanced on the property. The Fox Hills Formation was not encountered during drilling.

Review of mine maps show that the Columbine Mine and the Boulder Valley Mine operated from within the same coal seam.

8.0 DESCRIPTION OF HOLES

The description of rotary holes drilled on the project and adjacent projects are from the drill cuttings taken every five feet, and interpretation of geophysical logs for each boring. **Horst** indicates borings advanced on the Horst Property, **VR** indicates borings advanced on the Vista Ridge Property, and **S29** indicates borings advanced on the Pratt property. The Erie Estates Project borings are designated as **SB-1** and **SB-2**.

Horst Property

- Horst 1** A light brown arenaceous soil occurred from 0 to 20 feet. Light gray to brown claystone was penetrated from 20 to 60 feet. A light gray claystone was encountered from 60 to 275 feet. The "A" seam was encountered from 145 to 150 feet. The "main" seam interval was encountered from 280 to 285 feet. Circulation was lost at 275 feet. A 6 inch caliper deflection occurred at 280 feet. Total depth of the boring was 340 feet. Collapse was complete with no open voids.
- Horst 2** A light brown arenaceous soil occurred from 0 to 30 feet. Brown to gray claystone was penetrated from 30 to 320 feet. The "A" seam was encountered from 120 to 125 feet. The "main" seam occurred from 290 to 295 feet. No mine workings were penetrated. Total depth of the boring was 340 feet.
- Horst 3** A light brown arenaceous soil occurred from 0 to 10 feet. Light gray to brown claystone was penetrated from 10 to 80 feet. A light gray claystone was encountered from 80 to 265 feet. The "A" seam was encountered from 145 to 150 feet. The "main" seam interval occurred from 240 to 245 feet. Circulation was lost at 265 feet. Maximum caliper deflection of 7.2 inches occurred at 249 feet. Total depth of the boring was 300 feet. Collapse was complete with no open voids.

- Horst 4** A light brown arenaceous soil occurred from 0 to 20 feet. Light gray to brown claystone was penetrated from 20 to 95 feet. A light to medium gray claystone with carbonaceous stringers was encountered from 95 to 315 feet. The "A" seam was encountered from 160 to 165 feet. The "main" seam interval occurred from 315 to 320 feet. Circulation was lost at 315 feet. Maximum caliper deflection of 6.0 inches occurred at 310 feet. Total depth of the boring was 340 feet. Collapse was complete with no open voids.
- Horst 5** A light brown arenaceous soil occurred from 0 to 15 feet. Light gray to brown claystone was penetrated from 15 to 70 feet. A light gray claystone was encountered from 70 to 270 feet. The "A" seam was encountered from 120 to 125 feet. The "main" seam interval occurred from 285 to 290 feet. Circulation was lost at 275 feet. Maximum caliper deflection of 11 inches occurred at 284 feet. Total depth of the boring was 300 feet. Collapse was complete with no open voids.
- Horst 6** A light brown arenaceous soil occurred from 0 to 15 feet. Light gray to brown claystone was penetrated from 15 to 80 feet. A light gray claystone was encountered from 80 to 270 feet. The "A" seam was encountered from 105 to 110 feet. The "main" seam interval occurred from 235 to 240 feet. Circulation was lost at 230 feet. Maximum caliper deflection of 11 inches occurred at 238 feet. Total depth of the boring was 300 feet. Collapse was complete with no open voids.
- Horst 7** A light brown arenaceous soil occurred from 0 to 15 feet. Light gray to brown claystone was penetrated from 15 to 75 feet. A light gray claystone was encountered from 75 to 150 feet. A light gray sandstone was drilled from 155 to 230 feet. No coal seams were penetrated. No mine workings were encountered. Total depth of the boring was 230 feet.

- Horst 8** A light brown arenaceous soil occurred from 0 to 20 feet. Light gray to brown claystone was penetrated from 20 to 70 feet. A light to medium gray claystone was encountered from 80 to 260 feet. The "A" seam was encountered from 165 to 170 feet. Circulation was not lost. No mine workings were encountered. Total depth of the boring was 260 feet.
- Horst 9** A light brown arenaceous soil occurred from 0 to 15 feet. Light gray claystone was penetrated from 15 to 50 feet. A medium gray claystone was encountered from 50 to 325 feet. The "main" seam was encountered from 230 to 237 feet. No mine workings were penetrated. Total depth of the boring was 340 feet.
- Horst 10** A light brown arenaceous soil occurred from 0 to 15 feet. Light gray to brown claystone was penetrated from 15 to 70 feet. A medium gray claystone was encountered from 70 to 200 feet. The "A" seam was encountered from 130 to 135 feet. Circulation was lost at 200 feet. The "main" seam interval occurred from 235 to 240 feet. A maximum caliper deflection of 6 inches occurred at 223 feet. Total depth of the boring was 280 feet. Collapse was complete with no open voids.
- Horst 11** A light brown arenaceous soil occurred from 0 to 20 feet. Light gray to brown claystone was penetrated from 20 to 100 feet. A medium gray claystone was encountered from 100 to 340 feet. No mine workings were penetrated. Total depth of the boring was 340 feet.

Vista Ridge Property

- VR-6** Tan sandy argillaceous soil occurred from 0 to 20 feet. Tan claystone with carbonaceous clay was observed from 20 to 30 feet. Medium to light grey claystone was encountered from 30 to 60 feet. Medium to dark grey claystone with minor carbonaceous claystone was penetrated from 60 to 200 feet. Medium grey claystone with coal was encountered at 210 feet. Medium grey claystone was observed from 220 to 260 feet. The Columbine Mine "main" seam occurred at 260 to 270 feet. Light grey sandstone, was observed from 260 to 300 feet. Total depth of the hole was 300 feet. No mine workings were encountered.
- VR-7** Medium grey argillaceous soil occurred from 0 to 40 feet. Medium grey claystone with carbonaceous clay was observed from 40 to 50 feet. Medium grey claystone was encountered from 50 to 150 feet. Light grey claystone was penetrated from 150 to 170 feet. Medium to light grey claystone was encountered from 170 to 220 feet. Dark grey claystone was observed from 220 to 240 feet. Medium grey claystone was present from 240 to 260 feet. The Columbine Mine "main" seam occurred at 260 to 270 feet. Tan to grey claystone was observed from 270 to 300 feet. Total depth of the hole was 300 feet. No mine workings were encountered.
- VR-8** Tan sandy argillaceous soil occurred from 0 to 40 feet. Medium to dark grey claystone was penetrated from 40 to 180 feet. Light grey sandstone was encountered from 180 to 200 feet. Medium grey claystone was present from 200 to 220 feet. Light grey sandstone was observed from 220 to 270 feet. Medium grey claystone was located from 270 to 290 feet. Medium grey sandstone was present at 300 feet. Total depth of the hole was 300 feet. No mine workings were encountered.

VR-9 Tan sandy argillaceous soil occurred from 0 to 30 feet. Tan claystone was observed from 30 to 60 feet. Medium to light grey claystone was encountered from 60 to 170 feet. Medium to dark grey claystone was penetrated from 170 to 220 feet. Medium to light grey claystone was encountered from 220 to 280 feet. The Columbine Mine "main" seam occurred at 280 to 290 feet.. Medium grey claystone was observed from 290 to 300 feet. Total depth of the hole was 300 feet. No mine workings were encountered.

VR-10 Tan sandy argillaceous soil occurred from 0 to 20 feet. Tan and grey claystone was observed from 20 to 40 feet. Light grey claystone was encountered from 40 to 50 feet. Medium grey claystone was penetrated from 50 to 220 feet. The Columbine Mine "main" seam occurred from 230 to 240 feet.. Medium grey claystone was penetrated from 240 to 300 feet. Total depth of the hole was 300 feet. No mine workings were encountered.

Pratt Property

S29-2 Sandy clay soil occurred from 0 to 10 feet. Brown to iron stained claystone was drilled from 10 to 35 feet. From 35 feet to 295 feet, light gray to dark gray claystone was penetrated. Circulation was lost at 295 feet. The Columbine "main" seam occurred from 307 to 315 feet. Maximum caliper deflection of 7.8 inches at 309.8 feet was observed. Total depth of the hole was 320 feet. Collapse was complete, with no open voids.

S29-5 Sandy clay soil occurred from 0 to 15 feet. Light brown to gray to dark gray claystone with interbedded coal was drilled from 15 to 360 feet. Circulation was not lost. The Columbine "main" seam was penetrated from 267 to 275 feet. Negative caliper deflection was observed at this location. Collapse was complete with no open voids.

Erie Estates Property

SB-1 Light brown silty sandy clay was penetrated from 0 to 10 feet. From 10 to 45 feet sandy to silty brown grading to gray claystone was encountered. From 45 to 50 feet an oxidized coal seam (clinker) was present. From 50 to 130 feet medium gray claystone occurred. Light gray very fine grained quartzose sandstone was penetrated from 130 to 135 feet. From 135 to 243 feet medium gray claystone with minor carbonaceous intervals was drilled. From 243 to 285 feet interbedded coal and claystone was penetrated. Circulation was lost at 285 feet. From 285 feet to 330 feet claystone was encountered. The Upper Columbine "main" seam interval was drilled from 330 to 337 feet. Collapse was complete with no open voids. Total depth of the hole was 340 feet.

SB-2 Light brown silty sandy clay was penetrated from 0 to 10 feet. From 10 to 33 feet brown grading to gray claystone was encountered. From 33 to 36 feet carbonaceous claystone was present. From 36 to 101 feet medium gray claystone occurred. Carbonaceous claystone was penetrated from 101 to 106 feet. From 106 to 220 feet, interbedded claystone with carbonaceous layers were encountered. Circulation was lost at 220 feet. From 220 feet to 245 feet, drilling progress indicated undisturbed bedrock was present. From 245 to 275 feet fractured rock was penetrated. Drilling progress from 280 to 285 feet indicated in-place bedrock. Western Environment interprets that the Upper Columbine "main" seam was penetrated from 245 to 252 feet. The Lower Columbine "main" seam was interpreted to occur from 275 to 280 feet. Due to "Block Caving" at 215 feet no caliper log could be run.

9.0 POTENTIAL MECHANISMS OF COAL MINE ROOF FAILURE

The following presents what appears to be the most obvious progression for collapse and subsidence occurring within the Boulder-Weld Coal Field. This discussion is based upon research conducted by Western Environment personnel. However, it must be emphasized that all of the following explanations are theoretical and inferred interpretations.

The results of the numerous studies conducted by Western Environment show that when coal was removed, often no significant displacement of overlying beds occurred. Two possible explanations exist for this observation: 1) after mining, enough natural roof strength remained across the span of rooms to support the load and not fail, or 2) after roof failure, the collapse is somehow confined to a specific interval. In the majority of Western Environment projects, the caliper logs show that the rooms are not open and that the "back" or roof of the mine is down. Therefore, the collapse and subsequent bed deflections are somehow limited to a specific horizon.

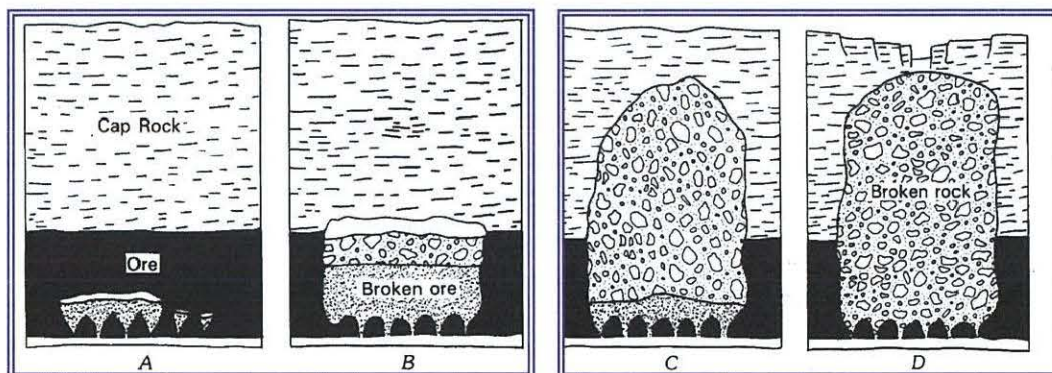
The idea of progressive collapse of overlying units continuing until a "pressure arch" or dome is formed above the collapsed workings is well-documented (U.S.G.S. Prof. Paper 969). Bell (1975) states that from his experiences in rock of similar character as those present in the Boulder-Weld Coal Field, upward migration is commonly one to two times the width of the intervening room. Ackenheil and Dougherty (1970) use a figure of twice the distance between supports for an approximation of arch development. Both of these estimates fit well with the observed results from the drilling on the site that show that collapse is confined to an interval of 20 to 40 feet above the workings. In addition to the "pressure arch", the caliper log indicated that no void is present within the mined zone or at the top of the arch. It is then necessary to increase the volume (decrease the density) of the overlying material in order that the void and developing arch is filled, potentially resulting in additional support (Bell, 1975). Testing performed on the claystone bedrock has shown that the clays can "swell" upon wetting in excess of 20% (ATEC, 1985). Therefore, a five foot void could be filled by the fracturing, wetting, and swelling of 25 feet of claystone.

Jeff Hynes, senior engineering geologist with the CGS, has expressed his opinion that the “swelling” of the claystone observed by Western Environment may actually be a result of expansion of the clays when the isostatic confining is removed during drilling. Additionally, Mr. Hynes had commented on his observation that floor “heave” is prevalent in operating Boulder-Weld coal mines. This is likely due to the higher uniaxial compressional strength of the coal (Western Environment, 2004) in relation to the claystone that commonly makes up the floor of the mine.

Regardless of the exact mechanism, it is evident that the following process involving collapse confinement and support are likely to occur within the Boulder-Weld Coal Field:

- 1) Formation of pressure arches approximately 20 to 40 feet above the mined seam, and
- 2) Increase in volume (by swelling, depressurizing, or floor heave) of claystone roof and floor rock.

The importance of the concept of the pressure arch increases as the depth to mining decreases. If mine geometry remains consistent, the pressure arch that forms 20-40 feet above the mine will encounter either weakened weathered rock or potential “fluid” soil at a mining depth of 80 feet or less. Should the top of the pressure arch contact either the weathered rock or soil, a “sink hole” can form. Therefore, due to the depth of the working beneath the Pratt Property project, **sinkhole development is unlikely.**



Progress of subsurface subsidence induced by the block caving method (Holzer, 1984)

10.0 STRAIN ANALYSIS

The strain analysis performed for this study is adapted from the United Kingdom National Coal Board's graphical strain profiling system. This method of strain prediction was developed for on-going long wall mining operations. To make the method applicable to abandoned room and pillar mines, several modifications and assumptions were made.

The first modification is to define the thickness of the void space. The standard method is to use the actual mined thickness of coal. However, the drill holes completed on the Pratt Property project and all adjacent sites show collapse to be complete. Therefore, to proceed with a "worst case" theoretical analysis, the following assumption was made: any increase in hole diameter greater than 50% (9 inches for 5 1/8 inch boring) will be treated as an open void. The amount of "theoretical" void for all holes intercepting the mine within the Columbine Mine and equivalent mined intervals was then averaged. Due to hole collapse in SB-2, Western Environment chose to utilize 4.0 feet of "theoretical" void which represents 2 times the maximum theoretical void identified on adjacent projects.. This results in a theoretical void space for the Pratt Property project of **0.80 feet** (Table 1).

Table 1. Depth to top of mined interval / Theoretical Void, Section 29

Boring	Depth to Top of Mined Interval	Theoretical Void (Feet)
Horst 1	280	0.0
Horst 2	290	NM
Horst 3	240	0.0
Horst 4	315	0.0
Horst 5	284	2.0
Horst 6	238	2.0
Horst 7	No Coal	No Coal
Horst 8	No Coal	No Coal
Horst 9	230	NM
Horst 10	235	0.0
Horst 11	No Coal	No Coal
S29-2	307	0.0
S29-5	267	0.0
SB-1	330	0.0
SB-2	245	4.0*
Average	272	0.80

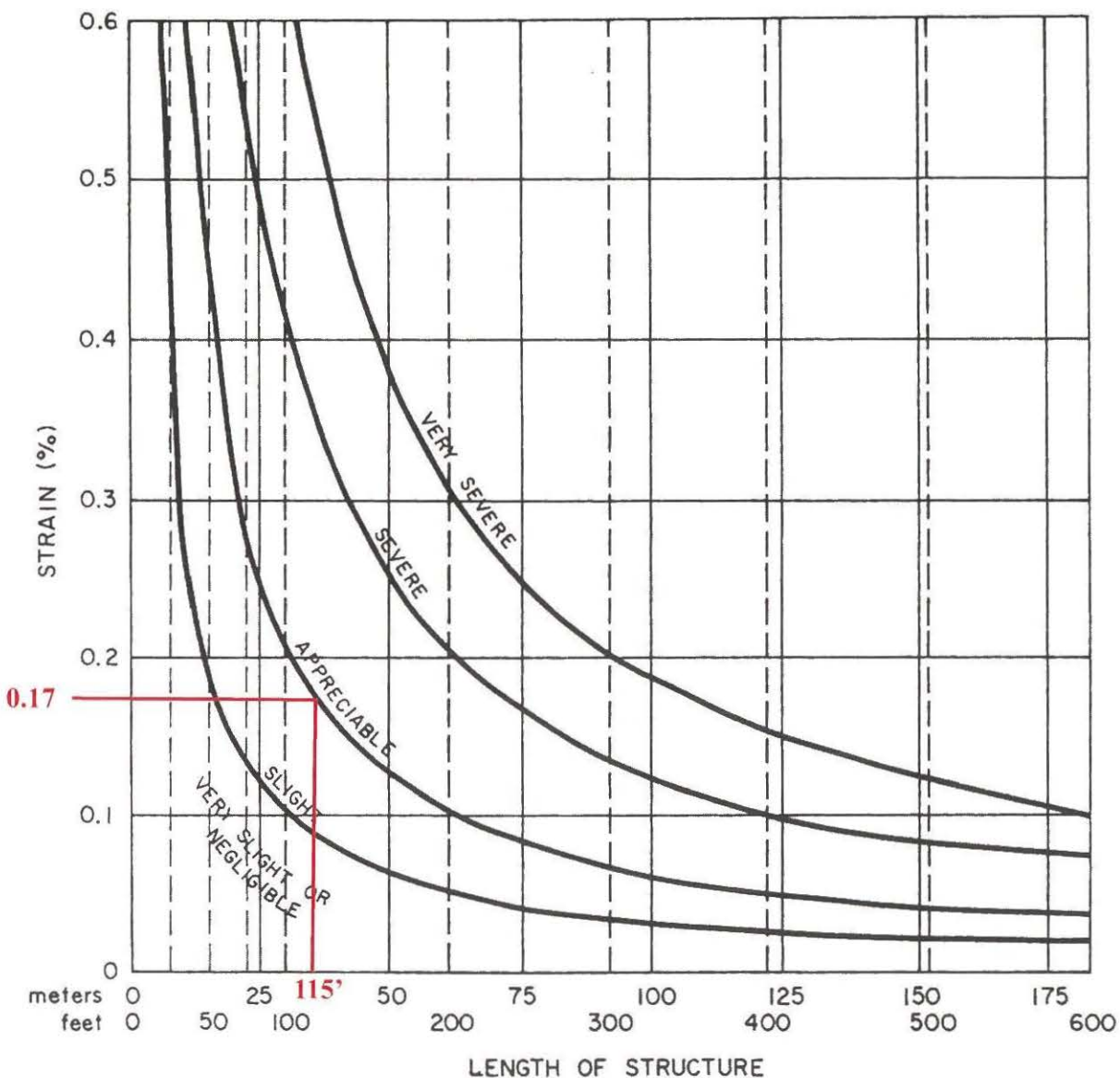
NM - Not Mined

* No caliper run, value taken as 2x the maximum theoretical void encountered on adjacent properties

The width of the extraction is critical to the analysis. Several options are available to use in the analysis. They include distance between drill holes, actual width (length) of the workings, or arbitrary values to produce the maximum amount of subsidence. Due to the apparent accuracy of the mine maps, Western Environment chose to use the width (length) of the workings shown on the mine map, which is approximately **200 feet**.

The reader is here encouraged to review both the United Kingdom National Coal Board's Subsidence Handbook, and the previous studies for the mechanics of the process. By using this information, and assuming that **multi-level mining was present at all undermined locations**, the maximum "worst case" theoretical horizontal strains would be **0.17%** with a maximum surface subsidence of **0.40** feet over a 290 foot profile.

These theoretical worst case strains are in-sufficient to cause "appreciable" damage to structures or foundation segments of **115 feet or less** (Figure 5).



CLASS OF DAMAGE	DESCRIPTION OF TYPICAL DAMAGE
VERY SLIGHT OR NEGLIGIBLE	SLIGHT CRACKS SHOWING IN WALLS AND CEILINGS INSIDE BUILDINGS, BUT NOT VISIBLE ON OUTSIDE.
SLIGHT	SLIGHT CRACKS SHOWING INSIDE THE BUILDING. DOORS AND WINDOWS WILL NOT CLOSE.
APPRECIABLE	SLIGHT CRACKS SHOWING BOTH OUTSIDE AND INSIDE BUILDING. DOORS AND WINDOWS WILL NOT CLOSE. DRAINS, SEWERS, AND GAS PIPES FRACTURE.
SEVERE	DRAINS, SEWERS, AND GAS PIPES FRACTURE. OPEN FRACTURES THROUGH WALLS OF BUILDING. WINDOW AND DOOR FRAMES DISTORTED. FLOORS NOTICEABLY SLOPING, WALLS LEANING OR BULGING NOTICEABLY. SOME LOSS OF BEARING OF BEAMS ON WALLS. PORTICOES AND FLOORS BUCKLE.
VERY SEVERE	WORSE THAN ABOVE AND REQUIRING PARTIAL OR COMPLETE REBUILDING. ROOF AND FLOOR BEAMS LOSE BEARING AND WALLS LEAN BADLY AND NEED EXTERNAL SUPPORT. WINDOWS BROKEN AND DISTORTED. SEVERE SLOPES, BUCKLING AND BULGING OF ROOFS AND WALLS OCCUR.

(FROM N.C.B.)

**WESTERN ENVIRONMENT
AND ECOLOGY, INC.**
2217 West Powers Avenue
Littleton, Colorado 80120

Figure 6 - Strain Percent to Length of Structure,
Approximately 330 Acres in Section 29,
Township 1 North, Range 68 West,
Erie, Colorado

11.0 CLOSURE

The recommendations provided herein were developed from the information obtained from field exploration which reflect subsurface conditions only at the specific locations, at the particular times designated. Subsurface conditions at other locations and times may differ from conditions occurring at these locations. The nature and extent of any variations between the drill holes may not become evident until or during the course of construction. If variations then appear, it may be necessary to re-evaluate the recommendations of this report after performing on-site observations during the excavation period and noting the characteristics of any variations.

This report was prepared by a Professional Engineering Geologist, not a Geotechnical Engineer, and should not be construed as, or substituted for, engineering. This report is intended to inform geotechnical and structural engineers working on building design of the potential earth forces that could develop at the site, and to assist the client in determining whether to acquire and develop the site in question.

Our professional services have been performed, our findings, and our recommendations prepared in, accordance with generally accepted geological principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

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APPENDICES

Appendix A

Architectural Techniques to Reduce Subsidence

ARCHITECTURAL TECHNIQUES TO REDUCE STRUCTURAL DAMAGE DUE TO SUBSIDENCE

Numerous papers have been written concerning building techniques designed to accommodate strain associated with subsidence (NTIS 1979). Presented below are some very basic strain reduction techniques which could be incorporated into structures located in these areas.

A structure of simple box form, designed to act as a unit, is best suited to resist the effects of mining subsidence. The smaller the plan of the building, the less likelihood there is of damage, and therefore, attached structures should be avoided. Where it is desired to retain the attached plan, this can be achieved by building units with adequate gaps between them to permit movement. Semi-detached buildings are preferable to detached. Outbuildings should not be attached structurally to the main building; they should be able to move independently.

The gaps between the structural units should be kept free from obstructions and should extend through the foundations; they should be sufficient to prevent adjacent units from coming into contact when the ground is deformed by subsidence. A gap of at least four inches is suggested for two-story buildings. Suitable gaps should be provided in all boundary walls especially when they abut a structure.

If required, areas between units should be paved with a flexible material, such as asphalt, incapable of offering any appreciable resistance to horizontal compression. Solid concrete paving should not be used.

Openings are a source of weakness in walls and should be kept as small as other considerations permit. Windows and doors are best arranged with substantial widths of brickwork around them so that the wall, whether reinforced or not, may be as strong as possible. Arched lintels should not be used. Corner windows, bay windows, and other similar projections weaken the structure, door openings have more serious weakening effects than windows and are best located in the shorter sides of buildings. If in the longer sided, they should be installed in the middle rather than at the ends of the building. Front and back doors should not be arranged closely side by side.

Floors and flat roofs should be fastened to all walls and not merely to those which carry

joists and rafters. Plasterboard or fiberboard should be used for ceilings. To ensure continued effective drainage if the building has been tilted by subsidence, the gradients of gutters should be kept higher than normal.

For complete protection against damage due to subsidence, a building would have to be able to resist the effects of vertical and horizontal differential movements. Protection against most damage by differential horizontal movements is comparatively simple and may be obtained by building the structure on a lightly reinforced concrete base slab which is bedded on granular material. The base slab ties the walls together and the flat underside forms slip surface. The total tensile strength of the slab in the direction of either principal axis should be adequate to resist a force equal to the product of half the weight of the structure on the slab and the coefficient of friction between the slab and granular material. Before placing the reinforcement and concrete in the base slab, the granular material in the sub-grade should be covered with a layer of stout waterproof paper (to form a slip plane). The provision of a reinforced base slab, combined with the recommendations already made, should be sufficient to prevent damage except where differential vertical movement occurs.

The resistance of the walls to flexure may be increased by the introduction of steel reinforcement in any brickwork. The additional cost of such reinforcement is justifiable only in structures certain to be subjected to severe differential vertical movements, such as those near the boundaries of mine workings. Horizontal reinforcement may be used in brick walls of any thickness, but vertical reinforcement can only be used in wall 9 inches thick or more. Special care is necessary where steel reinforcement is to be used in conjunction with brickwork; the metal will not be protected from corrosion in the same way as rods in well made concrete. Lime mortar should be used in brickwork. Damp-proof courses should be of the bituminous type.

The weakest mortar consistent with the normal load-carrying requirements of the walls should be used. This will allow the walls to adjust themselves to moderate changes of curvature of the ground without serious cracking. If the ground on which the structures are built is of a yielding nature, the conditions will be more favorable than if it is yielding since abrupt changes of curvature are less likely.

APPENDIX B
Lithologic and Geophysical Logs

Hole Number: S29-2
Drilled by: Plains Water Well Service
Date: 11/6/06

Location: N40°01.217 W105°01.198
Logged by: D. Greeley
Bit Size: 6.25 inches

State: Colorado
Total Depth: 320'
Drilled with: Mud

Depth	Sample Description
5	Clay, sandy, light brown to brown
10	Clay, sandy, light brown to brown
15	Claystone, silty, brown
20	Claystone, silty, brown
25	Claystone, silty, gray with rust stains
30	Claystone, silty, gray with rust stains
35	Claystone, silty, gray with rust stains
40	Claystone, silty, gray with rust stains
45	Claystone, dark gray
50	Claystone, dark gray
55	Claystone, dark gray
60	Claystone, dark gray
65	Claystone, dark gray
70	Claystone, dark gray
75	Claystone, dark gray
80	Claystone, dark gray
85	Claystone, dark gray
90	Claystone, dark gray
95	Claystone, dark gray
100	Claystone, dark gray
105	Claystone, dark gray
110	Claystone, dark gray
115	Claystone, dark gray
120	Claystone, dark gray
125	Claystone, dark gray
130	Claystone, dark gray
135	Claystone, dark gray
140	Claystone, dark gray
145	Claystone, dark gray
150	Claystone, dark gray
155	Claystone, dark gray
160	Claystone, dark gray
165	Claystone, dark gray
170	Claystone, dark gray
175	Claystone, dark gray

180	Claystone, dark gray	
185	Claystone, dark gray	
190	Claystone, dark gray	
195	Claystone, dark gray	
200	Claystone, dark gray	
205	Claystone, dark gray	
210	Claystone, dark gray	
215	Claystone, dark gray	
220	Claystone, dark gray	
225	Claystone, carbonaceous, dark gray with coal	
230	Claystone, dark gray	
235	Claystone, dark gray	
240	Claystone, dark gray	
245	Claystone, dark gray	
250	Claystone, dark gray to black with coal	
255	Claystone, gray	
260	Claystone, gray	
265	Claystone, gray	
270	Claystone, gray	
275	Claystone, gray	
280	Claystone, gray	
285	Claystone, gray	
290	Claystone, gray	
295	Circulation lost, no sample recovery	
300	No Recovery	
305	No Recovery	
310	No Recovery	
315	No Recovery	
320	No Recovery	Total Depth

Hole Number: S29-5

Drilled by: Plains Water Well Service

Date: 11/7/06

Location: N40°01.052 W105°01.413

Logged by: D. Greeley

Bit Size: 6.25 inches

State: Colorado

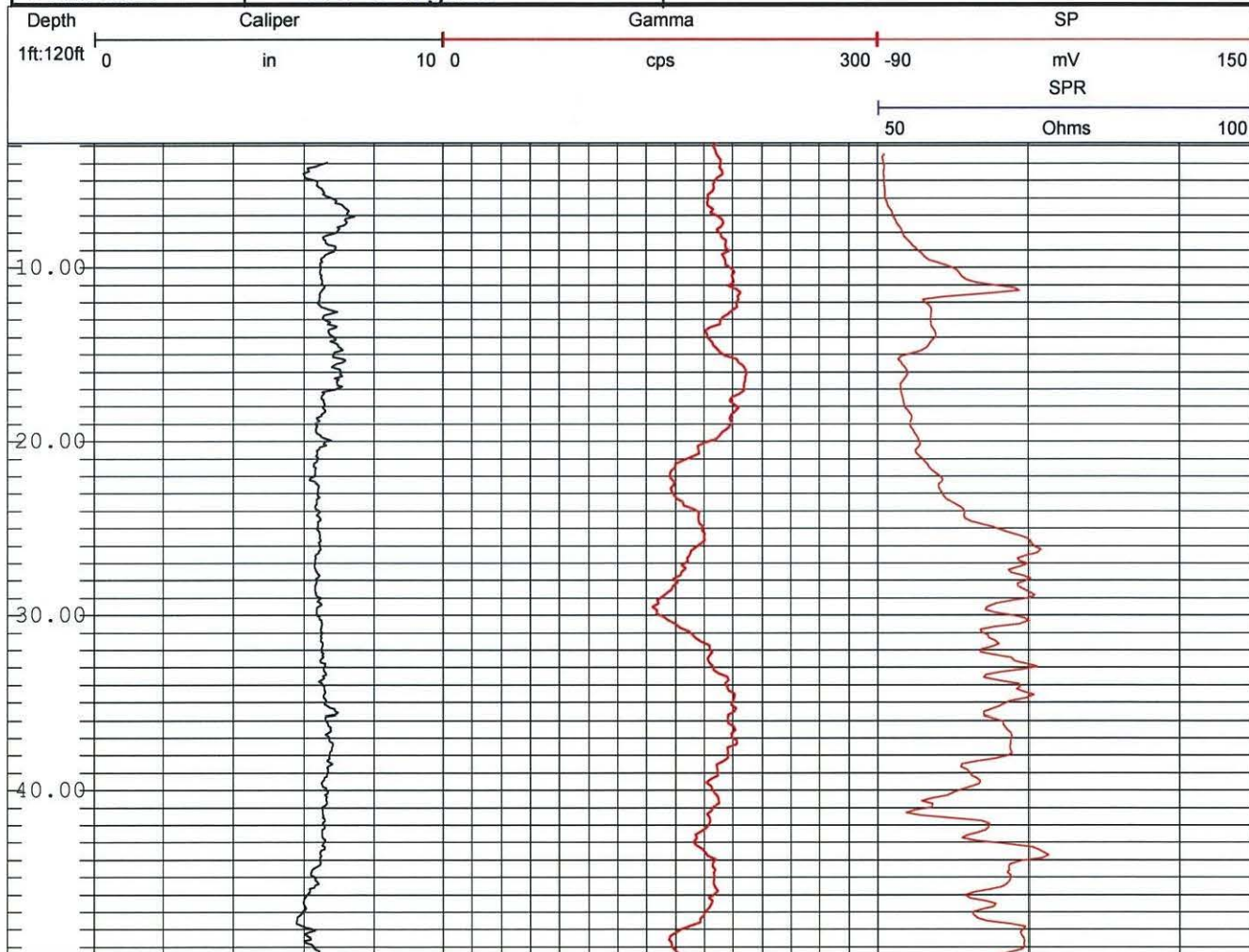
Total Depth: 360'

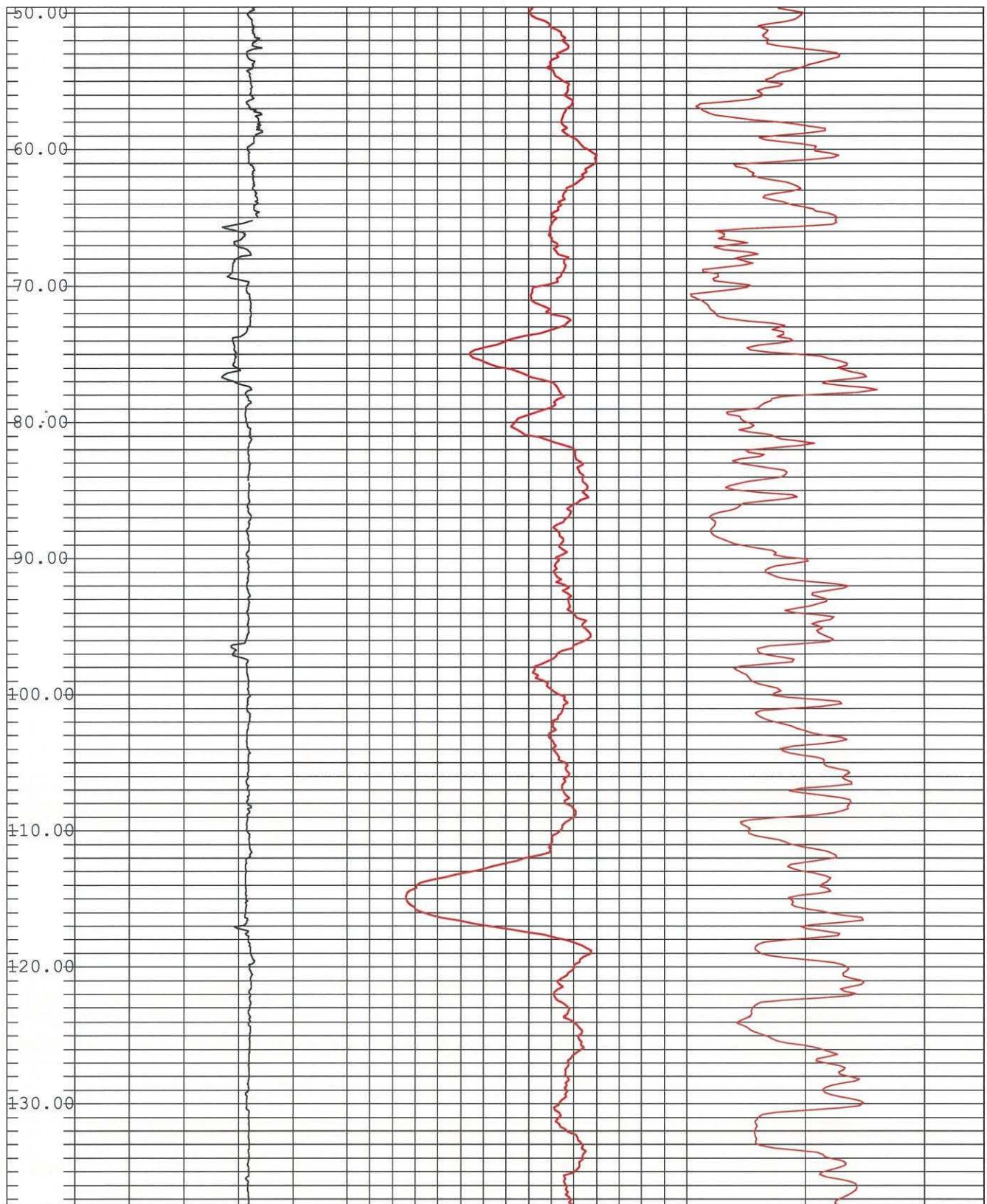
Drilled with: Mud

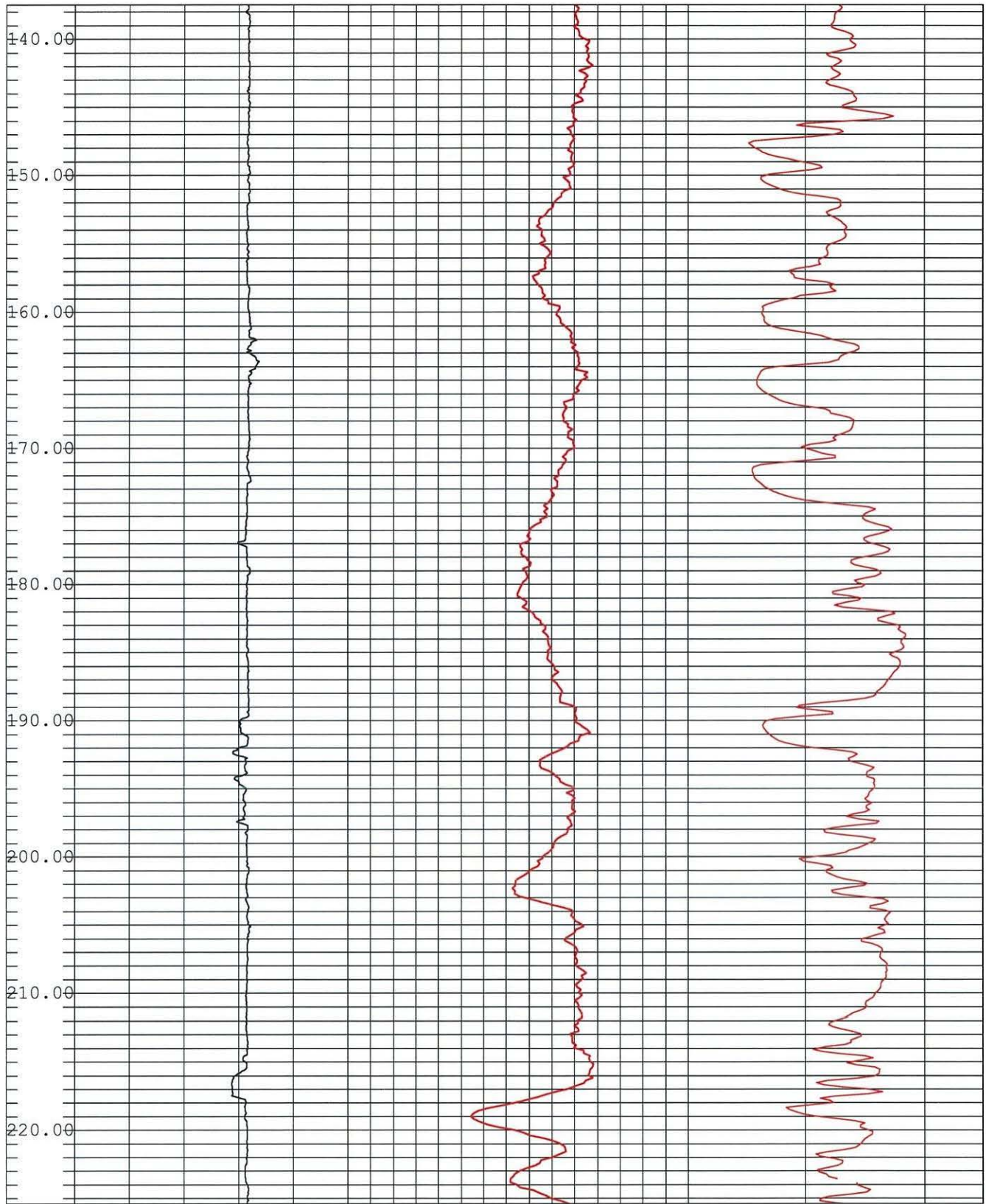
Depth	Sample Description
5	Clay, sandy, light brown to brown
10	Clay, sandy, light brown to brown
15	Clay, sandy, light brown to brown
20	Claystone, silty, light brown with rust
25	Claystone, silty, light brown with rust
30	Claystone, silty, light brown with rust
35	Claystone, silty, light brown with rust
40	Claystone, silty, light brown with rust
45	Claystone, silty, light brown with rust
50	Claystone, silty, light brown with rust
55	Claystone, silty, light brown with rust
60	Claystone, silty, light brown with rust
65	Claystone, silty, light brown with rust
70	Claystone, dark gray
75	Claystone, dark gray
80	Claystone, dark gray
85	Claystone, dark gray
90	Claystone, dark gray
95	Claystone, dark gray
100	Claystone, dark gray
105	Claystone, dark gray
110	Claystone, dark gray
115	Claystone, dark gray
120	Sandstone lense, gray
125	Claystone, dark gray
130	Claystone, dark gray
135	Claystone, dark gray
140	Claystone, dark gray
145	Claystone, dark gray
150	Claystone, dark gray
155	Claystone, dark gray
160	Claystone, dark gray
165	Claystone, dark gray
170	Claystone, dark gray
175	Claystone, dark gray

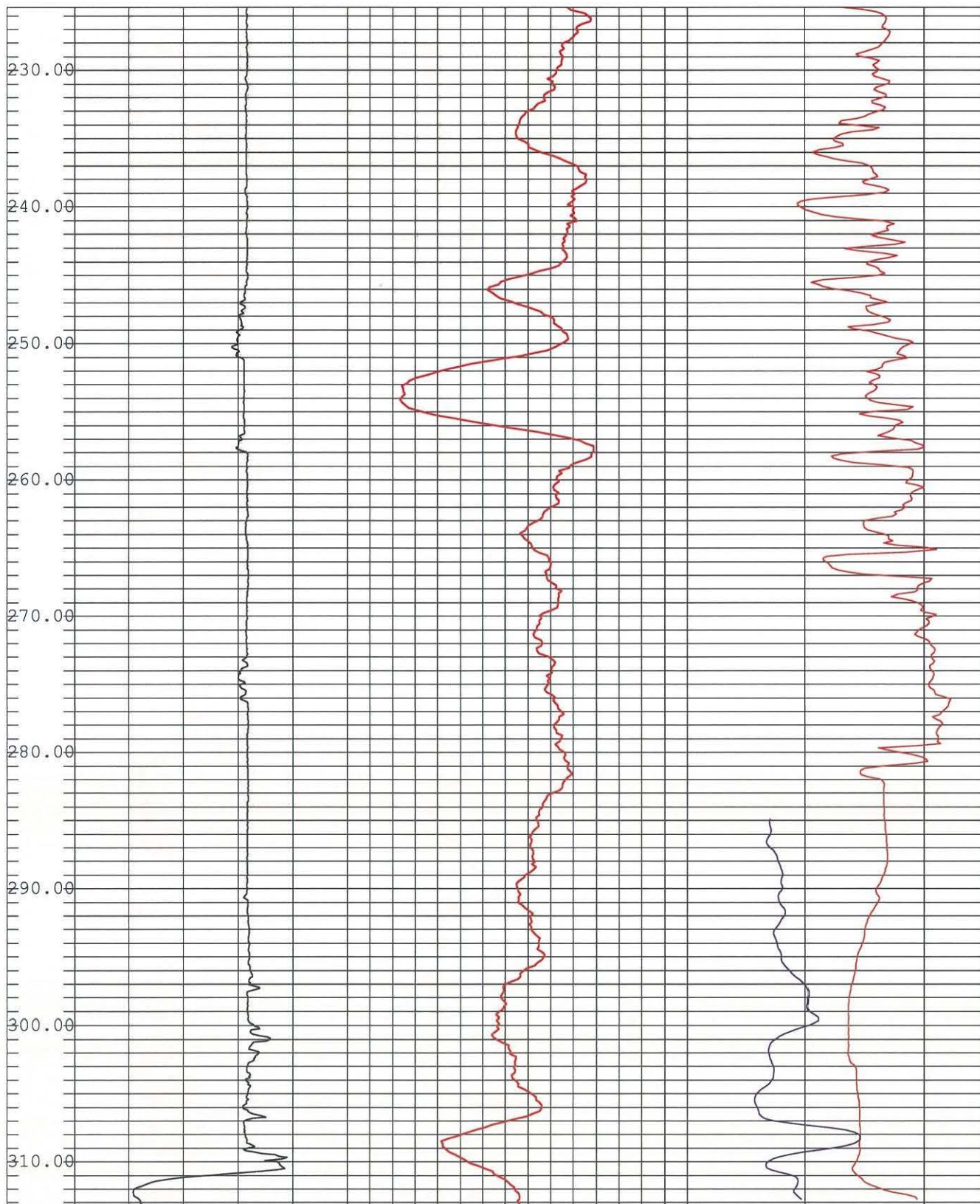
180	Claystone, dark gray	
185	Claystone, dark gray	
190	Claystone, dark gray	
195	Claystone, dark gray	
200	Claystone, dark gray	
205	Claystone, dark gray	
210	Claystone, dark gray, with coal	
215	Claystone, dark gray	
220	Claystone, dark gray	
225	Claystone, carbonaceous, dark gray	
230	Claystone, dark gray	
235	Claystone, dark gray	
240	Claystone, dark gray	
245	Claystone, dark gray	
250	Claystone, dark gray to black with coal	
255	Claystone, gray	
260	Claystone, gray	
265	Claystone, carbonaceous, dark gray, with coal	Columbine Main Seam
270	Claystone, gray	
275	Claystone, gray	
280	Claystone, gray	
285	Claystone, gray	
290	Claystone, gray	
295	Claystone, gray	
300	Claystone, gray	
305	Claystone, gray	
310	Claystone, gray	
315	Claystone, gray	
320	Claystone, gray	
325	Claystone, gray	
330	Claystone, gray	
335	Claystone, gray	
340	Claystone, gray	
345	Claystone, gray	
350	Claystone, gray	
355	Claystone, gray	
360	Claystone, gray	Total Depth

		COMPANY: ESTERN NVIRONMENT AND COLOGY, NC	
		Location: N40 01.217, W105 01.198	
Well	S29-2		OTHER SERVICES
Date	11/6/06	BH Fluid	Mud
Casing	None		
File Name	S29-2		
Depth Driller	320		
Depth Logger	318		
Logged by:	D. Greeley		
Witness:	B. Partington		



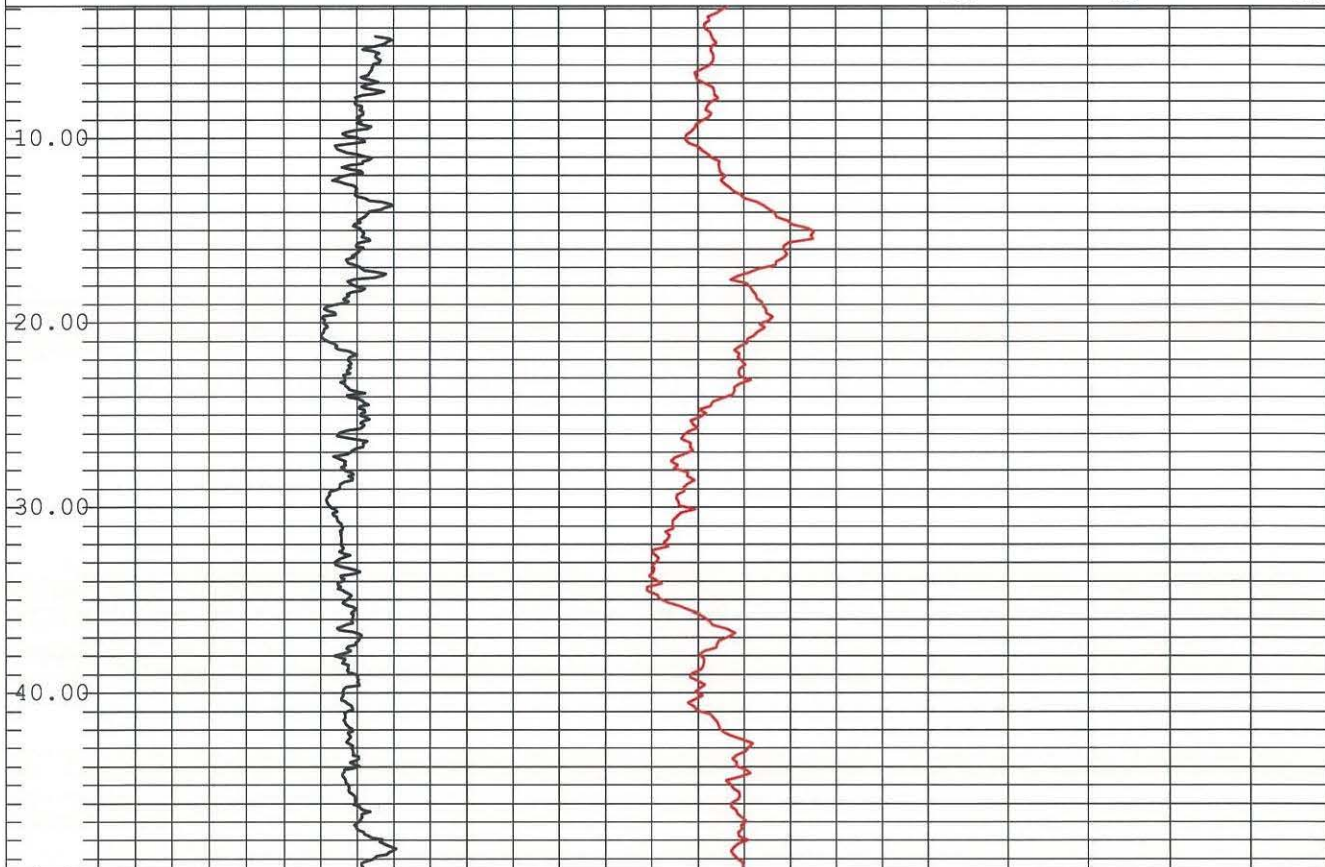
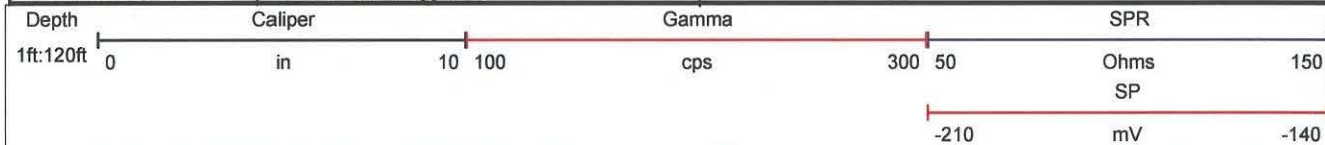


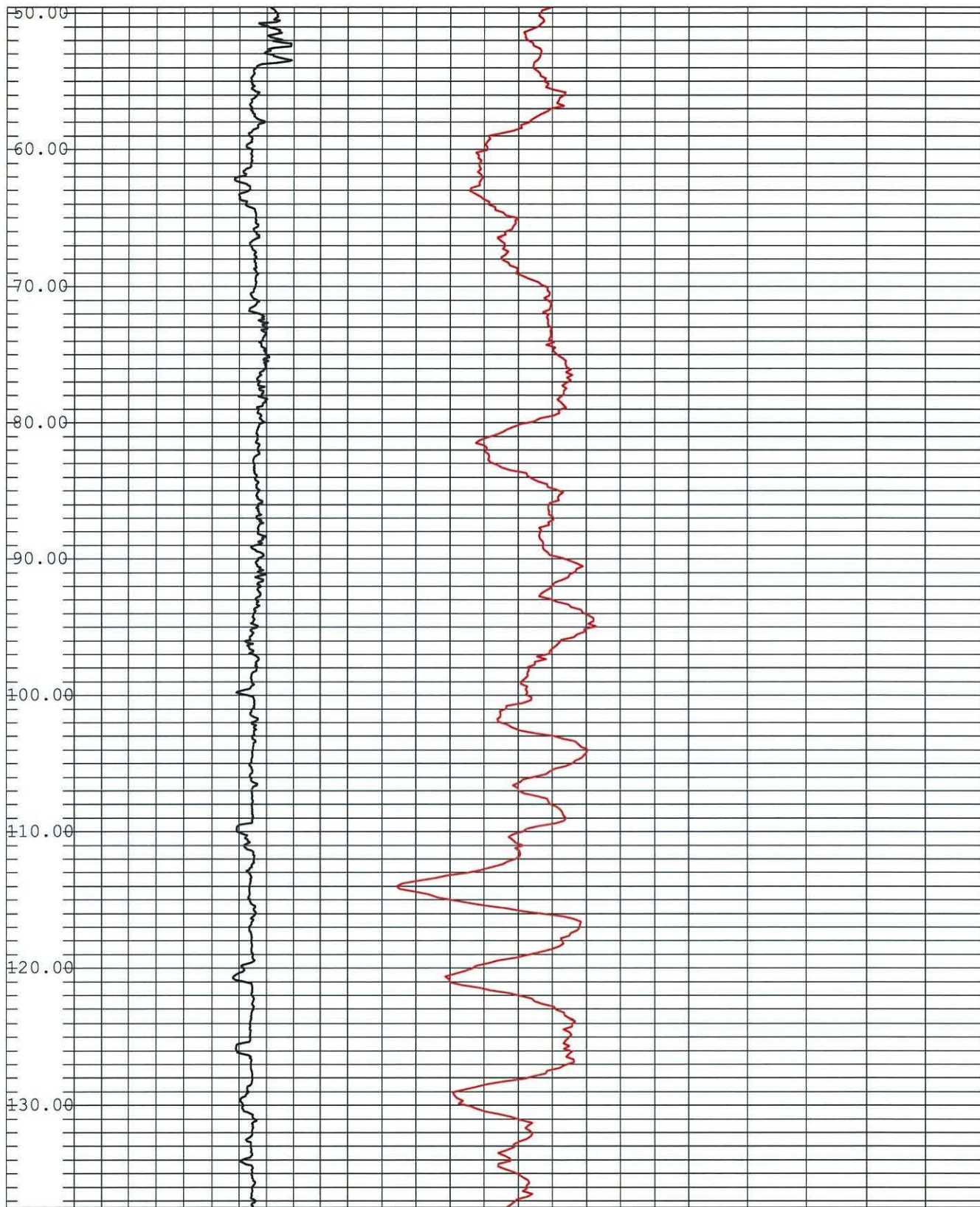


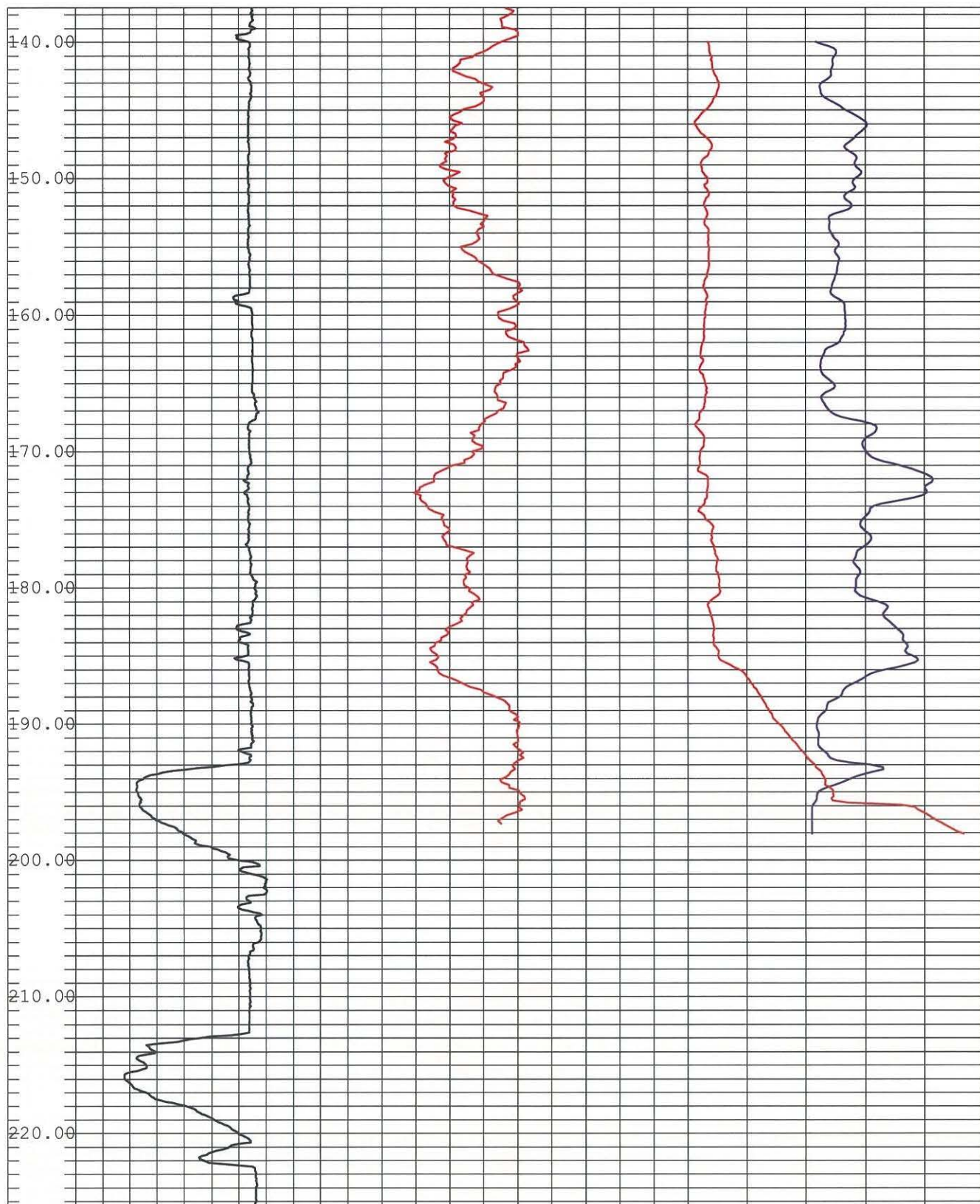


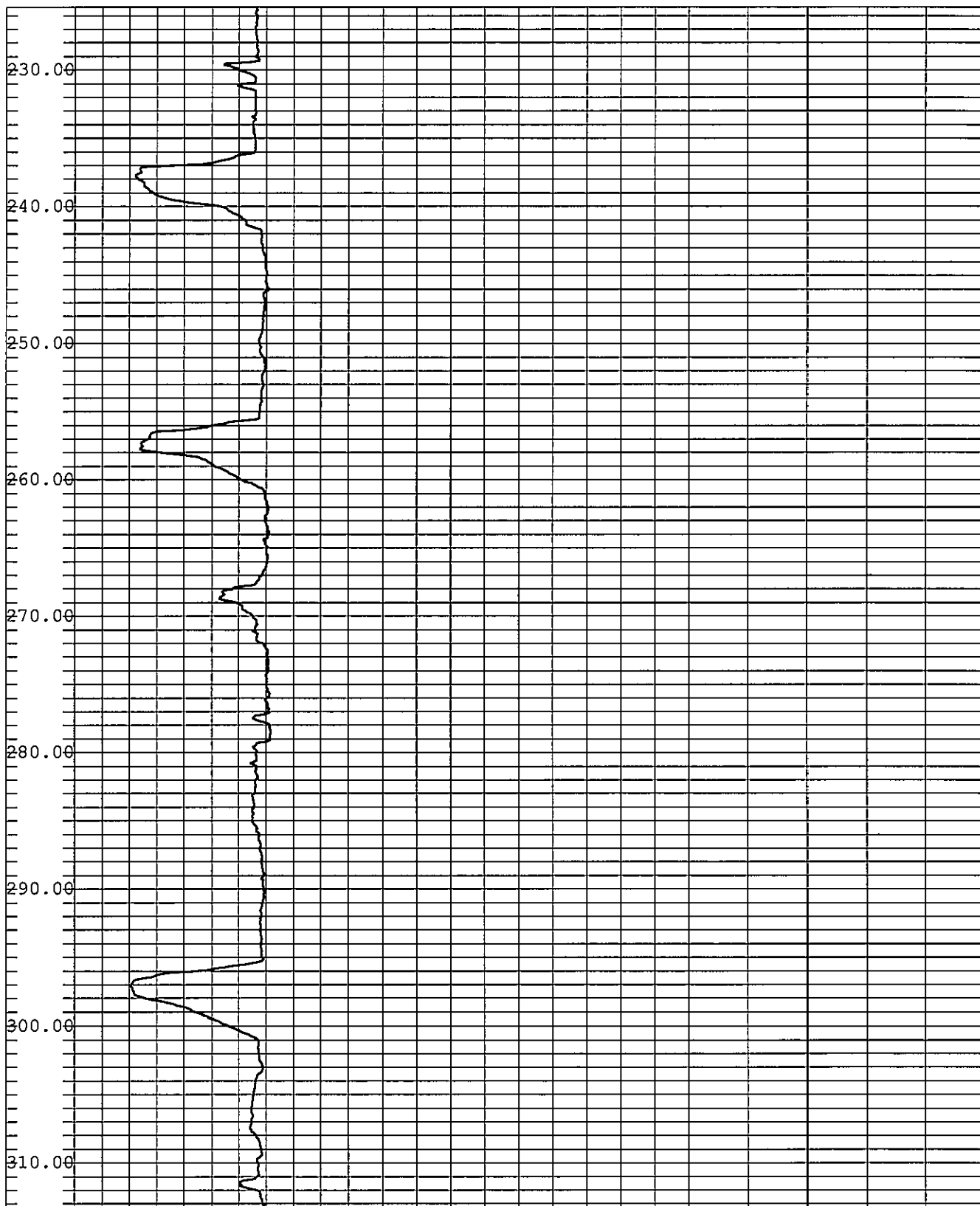
COMPANY: ESTERN NVIRONMENT AND COLOGY, NC	
Location: N40 01.052, W105 01.413	

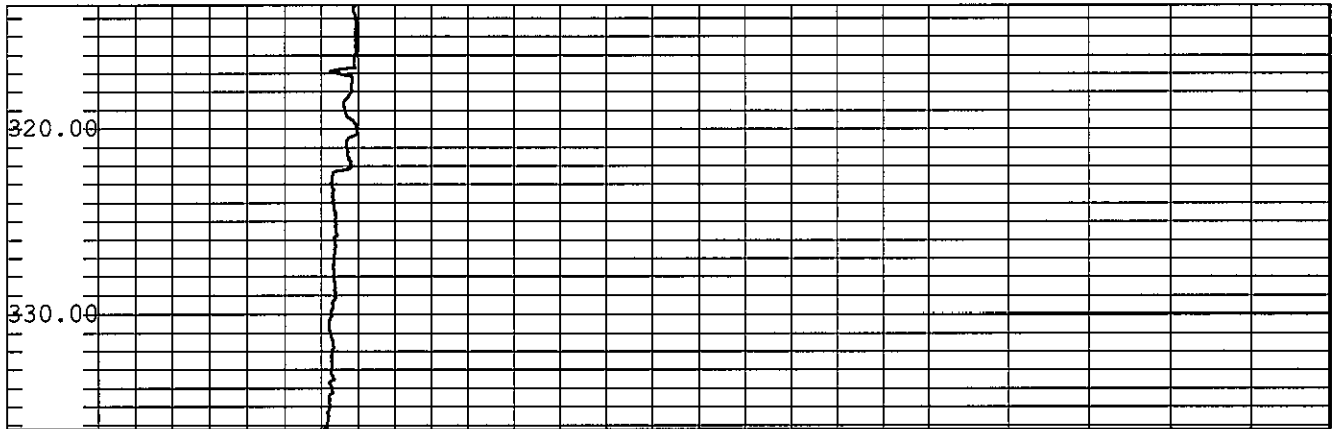
Well	S29-5			OTHER SERVICES
Date	11/7/06	BH Fluid	Mud	
Casing	None			
File Name	S29-5			
Depth Driller	380			
Depth Logger	336			
Logged by:	D. Greeley			
Witness:	B. Partington			











Alpine Ecological Resources, LLC

Wetland Delineation Report

330-Acre Property
Weld County, Colorado

*Prepared for: Cardno ATC
October 23, 2014*



Andy Herb, Ecologist/Owner
1127 Adams Street
Denver, CO 80206

Weld County 330 Acres Wetland Delineation Report

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Weld County 330 Acres

Wetland Delineation Report

1.0 Introduction

1.1 Purpose of This Report

The purpose of this report is to formally document the wetlands and other water features present in the study area. The primary reason for this documentation is to assist with project planning and design, which is intended to maximize avoidance of these features wherever practicable. The wetland and other water features described in this report include all those present, not just those that may be considered jurisdictional under Section 404 of the Clean Water Act.

1.2 Project Description

The current plan is to develop the property in a way that integrates residential areas within an extensive open space, parks and trails system, and a network of public streets. The proposed uses include single-family detached front-loaded homes of varying lot sizes in addition to single-family attached front-loaded homes. The current plan includes generous open space buffers to the north and east where landfills exist, and an extension of County Road 4 through the site, designed as a collector to improve the road system. The proposed density is 2.2 dwelling units per acre, but they will be clustered to preserve more than a third of the site as open space or developed park land.

Weld County 330 Acres

Wetland Delineation Report

2.0 Site Description

The 330-acre study area is in Weld County, approximately 2 miles southeast of the town of Erie, Colorado (**Figure 1**). It is immediately northwest of the intersection of County Road (CR) 4 and CR 5. It can be located on the United States Geological Survey (USGS) 7.5-minute series Erie, Colorado quadrangle and has the following coordinates (datum is NAD 83):

- Township 1 North, Range 68 W, Section 29
- Universal Transversal Mercator (UTM): 13 497789E, 4429915N
- Latitude/Longitude: 40.0194°N, 105.0259°W

The study area is approximately 4,600 feet above mean sea level and is flanked by residential development and a golf course on the south, residential development on the west, and landfills on the north and east. The site consists of rolling hills dominated by disturbed grasslands. The only current land use observed is oil and gas production; several wells are present in and adjacent to the study area. There are two unnamed tributaries to Coal Creek flowing through the site and the hydrologic unit code (HUC) is 10190005 (St. Vrain).

The site is located near the interface of the Front Range Fans and the Flat to Rolling Plains portions of the High Plains Ecoregion (EPA 2014). It is more typical of the Flat to Rolling Plains which is characterized by flat to rolling plains with intermittent streams situated between 3,600 and 5,700 feet above mean sea level. Typical vegetation for this part of the ecoregion is shortgrass prairie with riparian areas dominated by cottonwoods (*Populus* spp.), shrubs, and herbaceous vegetation. Typical land use is mostly dryland and irrigated cropland, grazing, oil and gas production, and some grassland.

The site is also in the Western Great Plains Range and Irrigated Land Resource Region (NRCS 2006). This Land Resource Region is delineated by the western edge of the Great Plains, abutting the foothills of the Rocky Mountains. The primary resource concerns in this region are overgrazing, wind and water erosion, invasive vegetation, and surface water quality.

Weld County 330 Acres

Wetland Delineation Report

3.0 Methods

3.1 Literature Review

Prior to conducting the field survey, numerous sources of data were reviewed to gain a general understanding of the ecology of the study area. These sources included National Wetlands Inventory (NWI) maps, aerial photographs, topographic maps, soil survey, local and federal regulatory agency websites, and other relevant data.

3.2 Field Data Collection

Andy Herb (senior ecologist) surveyed the entire study area on September 12, 13, and 16, 2014 to identify wetlands and other water features. These features were delineated within the defined study area using procedures outlined in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region* (Corps 2010). This involved a detailed examination of plants, soils, and hydrologic indicators present.

Generally, the detailed examination of each wetland involves the collection of vegetation, soil, and hydrology data at paired data points. These paired points include one point within the suspected wetland and one point in the adjacent upland. However, if numerous wetlands are in close proximity and surrounded by the same or similar upland plant community, then upland data points of nearby sites are often utilized, rather than creating a new upland data point for each wetland area.

All plants considered dominant in wetlands, as well as other commonly observed species, were identified and are listed in this report. During field examinations, a list of dominant plants was documented for each potential wetland area and was compared to the *National Wetland Plant List* (NWPL) (Corps 2014) to determine the "wetland indicator status" of each species. Generally, if at least 50 percent of those species had an indicator status of facultative (FAC) or wetter, the potential wetland area would satisfy the US Army Corps of Engineers (Corps) criterion for wetland vegetation. The botanical nomenclature presented in this report follows the NWPL. If a species is not listed in the NWPL, then the nomenclature follows the PLANTS Database (NRCS 2014).

Soils were examined at various locations throughout the study area to identify the presence of hydric soil indicators. If indicators were found, multiple pits may have been dug along the gradient to identify the extent of hydric soils.

While recording plant species and identifying soil characteristics, potential wetlands within the study area were assessed for evidence and potential sources of wetland hydrology. This evidence included primary indicators such as the presence of surface water and saturation, and secondary indicators including surface soil cracks and drainage patterns.

Most surrounding uplands were not formally sampled or recorded on data forms, and were generally examined while attempting to identify wetland areas. Those uplands examined in more detail or recorded on data forms typically exhibited evidence of at least one wetland indicator (hydrophytic vegetation, hydric soils, or wetland hydrology). Data collected for all areas investigated and deemed non-wetland are not necessarily included in this report.

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Wetland Delineation Report

3.3 Mapping

After determining the approximate extent of the wetlands based on the presence of hydric soils, hydrophytic vegetation, and wetland hydrology, the wetland boundary was flagged and recorded using survey equipment. This equipment generally provides accuracy to within one or two centimeters.

3.4 Wetland Classification

Wetlands in the study area were classified in accordance with the *Hydrogeomorphic Method* (HGM) (Brinson 1993) and the *Classification of Wetlands and Deep Water Habitats of the United States* (Cowardin, et al. 1979).

There are two HGM classifications applicable to the wetlands in the study area, including riverine and depressional. Riverine wetlands are those that are associated with a stream channel, floodplain, or terrace and primarily supported by overbank flows or shallow subsurface flow associated with the channel. Depressional wetlands are those that are situated in topographic depressions that do not contain permanent water deeper than 6.6 feet.

The Cowardin classification scheme includes only one wetland type that applies to wetlands in the study area: palustrine emergent (PEM). PEM wetlands are those dominated by herbaceous vegetation (grasses, grass-like, and forbs).

3.5 Wetland Functional Assessment

Wetland functions were generally assessed using the concepts presented in the *Functional Assessment of Colorado Wetlands (FACWet) Method* (Johnson, et al. 2013), although a complete assessment was not conducted. FACWet is a rapid assessment method that provides a reliable and consistent approach to rating the condition of wetlands relative to their natural potential by focusing on the presence of stressors. Stressors are human-caused changes to a wetland or adjacent lands that alter a wetland's ability to perform ecological functions and processes.

3.6 Jurisdictional Status

The jurisdictional status of wetlands and other water features is generally based on the *US Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook* (Corps 2007) and other Corps documents (Corps 2008). In order for an aquatic feature to be considered a "water of the US" and jurisdictional under Section 404 of the Clean Water Act, it must be at least one of the following:

- A traditional navigable water (TNW)
- A wetland adjacent to a TNW
- A relatively permanent water (RPW), including tributaries that typically flow year-round or have a continuous flow at least seasonally, typically three months
- A wetland that directly abuts a RPW
- A wetland adjacent to a RPW, but only if it can be shown that the feature has a "significant nexus" with a TNW

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- A non-RPW or wetland adjacent to a non-RPW, if the feature has a “significant nexus” with a TNW

The significant nexus evaluation includes an assessment of the flow characteristics and functions of the feature to see if it has “more than an insubstantial or speculative effect on the chemical, physical, or biological integrity of TNWs (Corps 2007).” If it does, then it is considered jurisdictional.

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4.0 Wetlands

The study area contains four individual wetland areas encompassing a total of 2.85 acres (Wetlands A through D). All of these wetlands are associated with unnamed tributaries to Coal Creek, which is located approximately 0.5 mile west of the study area. The wetlands are listed in **Table 1**, shown on **Figure 2**, and briefly described in the following sections. Wetland Determination Data Forms for all the wetlands are in **Appendix A** and photos are in **Appendix B**.

Wetland A is expected to be considered jurisdictional under Section 404 of the Clean Water Act as a result of connections to Coal Creek, which is likely considered a RPW. Wetlands B, C, and D appear to be hydrologically isolated, with no connection to or significant nexus with Coal Creek, or other RPWs or TNWs.

Table 1: Wetlands in the Study Area

Wetland	Cowardin Classification	HGM Classification	Area (acres)	Notes
South Unnamed Tributary				
Wetland A	PEM	Riverine	2.41	Wetlands in and along a small channel
North Unnamed Tributary				
Wetland B	PEM	Depressional	0.30	Wetland fringe around old pond with non-wetland spring and channel
Wetland C	PEM	Depressional	0.13	Wetland fringe around old pond
Wetland D	PEM	Depressional	<0.01	Small wetland below dam of old pond
		Total	2.85	

4.1 General Description

South Unnamed Tributary Wetlands: The South Unnamed Tributary contains one wetland (Wetland A). This wetland runs through the southwest portion of the study area and carries water from east to west. It is the largest wetland in the study area and generally consists of PEM fringe along both sides of a narrow and shallow channel (**Photos 1—9 in Appendix B**). In some areas, especially in the upper portion of the tributary, the wetlands fill the entire channel (from bank to bank). In other areas, especially in the middle reach, the fringe is discontinuous and very narrow (1 to 3 feet wide) as a result of channel degradation (down-cutting). The soils along the tributary are generally very thick clay, which was evident in some of the exposed banks.

Adjacent areas are generally very weedy and previously disturbed, presumably by historic agriculture or grazing activities. There is a golf course and dense residential development along the tributary immediately upstream of the study area, including a man-made pond.

Weld County 330 Acres Wetland Delineation Report

North Unnamed Tributary Wetlands: The North Unnamed Tributary contains three wetlands (Wetlands B, C and D) and all are associated with man-made ponds (see *Section 5.0 Other Water Features*). The drainage runs through the north portion of the study area and carries water from east to west. There is a spring upstream of the ponds that appears to discharge water seasonally (**Photo 16 in Appendix B**). Wetlands B and C consist of PEM wetland fringes around open water in the ponds, and Wetland D is a very small PEM wetland at the base of the lowest of the three dams (**Photos 10–15 in Appendix B**). There is a fourth old pond at the downstream end of the tributary, but it doesn't contain water at enough frequency or duration to be considered a wetland or other water feature.

Adjacent areas are similar to that of the South Unnamed Tributary and are generally very weedy and previously disturbed, presumably by historic agriculture or grazing activities. This tributary has a landfill both upstream and downstream of the study area, leaving this reach disconnected from the rest of the tributary.

4.2 Vegetation

All of the wetlands in the study area are classified as PEM. A list of the most common plant species observed in and near the wetlands is provided in **Table 2**. A brief discussion of the vegetation in the different wetland areas follows the table. More information can be found on the data forms in **Appendix A**.

Weld County 330 Acres Wetland Delineation Report

Table 2: Common Plants Found In and Near Wetlands in the Study Area

Common Name	Scientific Name ¹	Indicator Status ²
Woody Plants		
Russian olive	<i>Elaeagnus angustifolia</i>	FACU
Rubber rabbitbrush	<i>Ericameria nauseosus</i>	UPL
Green ash	<i>Fraxinus pennsylvanica</i>	FAC
Plains cottonwood	<i>Populus deltoides</i>	FAC
Golden currant	<i>Ribes aureum</i>	FACU
Peachleaf willow	<i>Salix amygdaloides</i>	FACW
Narrowleaf willow	<i>Salix exigua</i>	OBL
Five stamen tamarisk	<i>Tamarix chinensis</i>	FACW
Herbaceous Plants		
Crested wheatgrass	<i>Agropyron cristatum</i>	UPL
Showy milkweed	<i>Asclepias speciosa</i>	FAC
Haldberdleaf orache	<i>Atriplex patula</i>	FACW
Mexican fireweed	<i>Bassia scoparia</i>	FACU
Devil's pitchfork	<i>Bidens frondosa</i>	FACW
Smooth brome	<i>Bromus inermis</i>	UPL
Cheatgrass	<i>Bromus tectorum</i>	UPL
Clustered field sedge	<i>Carex praegracilis</i>	FACW
Canadian thistle	<i>Cirsium arvense</i>	FACU
Field bindweed	<i>Convolvulus arvensis</i>	UPL
Canadian horseweed	<i>Conyza canadensis</i>	UPL
Golden tickseed	<i>Coreopsis tinctoria</i>	FAC
Large barnyard grass	<i>Echinochloa crus-galli</i>	FAC
Common spikerush	<i>Eleocharis palustris</i>	OBL
Slender wildrye	<i>Elymus trachycaulus</i>	FACU
Creeping wildrye	<i>Elymus repens</i>	FACU
Fringed willowherb	<i>Epilobium ciliatum</i>	FACW
Velvetweed	<i>Gaura parviflora</i>	UPL
American licorice	<i>Glycyrrhiza lepidota</i>	FACU
Common sunflower	<i>Helianthus annuus</i>	FACU
Foxtail barley	<i>Hordeum jubatum</i>	FACW
Deer root	<i>Iva axillaris</i>	FAC
Baltic rush	<i>Juncus balticus</i>	FACW
Lesser poverty rush	<i>Juncus tenuis</i>	FAC
Prickly lettuce	<i>Lactuca serriola</i>	FAC
Yellow sweetclover	<i>Melilotus officinalis</i>	FACU
Hairy evening primrose	<i>Oenothera villosa</i>	FACU
Common panic grass	<i>Panicum capillare</i>	FAC
Wand panic grass	<i>Panicum virgatum</i>	FAC
Western wheatgrass	<i>Pascopyrum smithii</i>	FACU
Dockleaf smartweed	<i>Persicaria lapathifolia</i>	OBL

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Common Name	Scientific Name ¹	Indicator Status ²
Reed canarygrass	<i>Phalaris arundinacea</i>	FACW
Great plantain	<i>Plantago major</i>	FAC
Kentucky bluegrass	<i>Poa pratensis</i>	FACU
Yard knotweed	<i>Polygonum aviculare</i>	FACU
Annual rabbitfoot grass	<i>Polypogon monspeliensis</i>	FACW
Curly dock	<i>Rumex crispus</i>	FAC
Saltmarsh club rush	<i>Schoenoplectus maritimus</i>	OBL
Softstem clubrush	<i>Schoenoplectus tabernaemontani</i>	OBL
Cutleaf nightshade	<i>Solanum triflorum</i>	UPL
Tall goldenrod	<i>Solidago altissima</i>	FACU
Spinyleaf sowthistle	<i>Sonchus asper</i>	FAC
White heath American aster	<i>Symphotrichum ericoides</i>	FACU
Common dandelion	<i>Taraxacum officinale</i>	FACU
Field pennycress	<i>Thlaspi arvense</i>	FACU
Narrowleaf cattail	<i>Typha angustifolia</i>	OBL
Broadleaf cattail	<i>Typha latifolia</i>	OBL
Carpet vervain	<i>Verbena bracteata</i>	FACU
Blue water speedwell	<i>Veronica anagallis-aquatica</i>	OBL
Rough cocklebur	<i>Xanthium strumarium</i>	FAC

¹ Nomenclature presented in this table follows the National Wetland Plant List (Corps 2014); if the species is not listed then nomenclature follows the PLANTS database (NRCS 2014).

² Indicator status is from the National Wetland Plant List (Corps 2014): OBL = obligate wetland species, >99% probability of occurring in a wetland; FACW = facultative wetland species, 67-99% probability of occurring in a wetland; FAC = facultative species, 34-66% probability of occurring in a wetland; FACU = facultative upland species, <33% probability of occurring in a wetland; and UPL = <1% probability of occurring in a wetland. If the species is not included in the National Wetland Plant List then the indicator status is assumed to be UPL.

South Unnamed Tributary Wetlands: By far the most dominant plant in Wetland A is cattail (*Typha* spp.). The other most common herbaceous plants found in the wetlands are softstem clubrush, curly dock, dockleaf smartweed, and common spikerush. There is one large pocket of narrowleaf willow at the downstream end of the tributary but otherwise, woody vegetation is very widely scattered and consists of a few young plains cottonwood and peachleaf willow.

The wetland boundary is very distinct in most areas as a result of abrupt changes in topography. It generally consists of a transition from drier wetland plants like dockleaf smartweed, curly dock, and halberdleaf orache to mesic (but upland) species like Canadian thistle, Kentucky bluegrass, creeping wildrye, yellow sweetclover, and slender wildrye.

North Unnamed Tributary Wetlands: Similar to Wetland A, the wetlands in the North Unnamed Tributary are almost exclusively dominated by cattail and the wetland boundary is very distinct in most areas as a result of abrupt changes in topography. The boundary generally consists of a transition from dense cattail to sparse cattail with drier wetland plants like peachleaf willow and plains cottonwood saplings, curly dock, and deer root.

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4.3 Hydrology

South Unnamed Tributary Wetlands: The wetland hydrology for Wetland A is provided by surface flows in the tributary and capillary action associated with shallow groundwater. Surface flows have likely increased in recent years as the watershed has become more developed (mainly residential). These flows are likely seasonal or related to precipitation events, and probably not perennial. Flows were high during the field survey as a result of recent rains. Evidence of very high flows were observed, including rafted debris as much as 3 feet above the low flow channel elevation. These flows were likely present in September 2013 when widespread flooding occurred between Denver and Fort Collins.

Wetland hydrology indicators observed in Wetland A include: Surface Water (A1), High Water Table (A2), Saturation (A3), Drift Deposits (B3), and Geomorphic Position (D2). Wetland A is a tributary to Coal Creek, which is a perennial tributary to Boulder Creek and an RPW.

North Unnamed Tributary Wetlands: The wetland hydrology for Wetlands B, C, and D is provided by surface flows in the tributary, including discharge from the seasonal spring at the upper end of Wetland B and capillary action associated with shallow groundwater. Flows in this tributary (and probably the spring) have likely been altered by the presence of the landfill in the upper reaches of the watershed. Flows appear to be seasonal or related to precipitation events, and not perennial. Although no flows were observed during the field visit, each of the ponds associated with the wetlands contained water 0.5 to 2+ feet deep, and standing water was observed in these areas on the 2013 aerial photo.

Wetland hydrology indicators observed in the North Unnamed Tributary Wetlands include: Surface Water (A1), Saturation (A3), Surface Soil Cracks (B6), Salt Crust (B11), Hydrogen Sulfide Odor (C1), Crayfish Burrows (C8), Inundation Visible on Aerial Imagery (C9), and Geomorphic Position (D2). Wetlands B, C, and D appear to be hydrologically isolated as a result of the landfill downstream of the study area.

4.4 Soils

According to the Web Soil Survey (NRCS 2014a), the most common mapped soils in the study area are (in descending order): Midway-Shingle Complex, Ulm clay loam, Colombo clay loam, Renohill clay loam, and Wiley-Colby Complex. None of these soils or their minor components are listed as hydric.

South Unnamed Tributary Wetlands: The soils in the vicinity of the South Unnamed Tributary are all mapped as Colombo clay loam (NRCS 2014a). This soil is found on floodplains and terraces, and is derived from stratified calcareous alluvium. It is generally well-drained and has a normal depth to water table of more than 80 inches. The typical profile includes clay loam to 14 inches; stratified loam and clay loam between 14 and 21 inches; and stratified sand, loam, and clay loam between 21 and 60 inches.

Soil pits excavated in and near Wetland A (SP-A1, A2, and A3) generally confirmed the mapped soil type, revealing silty clay to a depth of about 18 inches. The hydric soil indicator observed in the wetland soil pit was Depleted Matrix (F3).

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Wetland Delineation Report

North Unnamed Tributary Wetlands: The soils in the vicinity of the North Unnamed Tributary are part of the Midway-Shingle Complex (NRCS 2014a). The complex includes 50 percent Midway and similar soils, 35 percent Shingle and similar soils, and 15 percent other minor components. Both Midway and Shingle soils are found on ridges and hills, and are derived from calcareous residuum weathered from shale. Both are well-drained and have a normal depth to water table of more than 80 inches. The typical profile of Midway is clay to a depth of 13 inches and weathered bedrock between 13 and 17 inches. Shingle has a typical profile of loam to 6 inches, clay loam between 6 and 18 inches, and unweathered bedrock from 18 to 22 inches.

Soil pits excavated in and near Wetland B (SP-B1 and B2) generally confirmed the mapped soil type, revealing silty clay to a depth of about 18 inches. The hydric soil indicators observed in the wetland soil pit were Hydrogen Sulfide (A4) and Depleted Matrix (F3).

4.5 Wetland Functions

Based on the concepts presented in the FACWet Method (Johnson, et al. 2013), the primary functions provided by the wetlands in the study area are support of wildlife habitat and sediment retention. These functions are a result of the wetlands generally having a relatively dense vegetation community along a channel, surrounded by relatively undeveloped lands. The most common stressors to the wetlands include presence of development in the watershed; severe alteration of the water source and water distribution associated with nearby development (including the golf course, residential areas, and landfills) and the multiple dams; channel incision/entrenchment; and overall soil disturbances (dams, excavations, etc.).

A complete assessment of the wetlands using FACWet will be required prior to permitting if wetland impacts exceed 0.5 acre or an Individual Section 404 permit is required.

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5.0 Other Water Features

There are five other water features in the study area, including one channel associated with the South Unnamed Tributary, and three ponds and a channel associated with the North Unnamed Tributary. A summary of these features is provided in **Table 3** and they are shown on **Figure 2**.

The only other water feature expected to be jurisdictional under Section 404 of the Clean Water Act is the channel of the South Unnamed Tributary, since it is connected to Coal Creek which is likely a RPW. The other features are hydrologically isolated as a result of the landfill.

Table 3: Other Water Features in the Study Area

Feature	Area (acres)	Length (feet)	Notes
South Unnamed Tributary	-	3,066	Main channel
North Unnamed Tributary	-	320	Channel from seasonal spring to Pond B
Pond B	0.16	-	Pond associated with Wetland B
Pond C	0.34	-	Pond associated with Wetland C
Pond D	0.53	-	Pond associated with Wetland D
Total	1.03	3,386	

South Unnamed Tributary Water Features: The only other water feature associated with the South Unnamed Tributary is the channel of the tributary itself (**Photos 2—5, and 9 in Appendix B**). It appears to be intermittent or ephemeral. The channel averages approximately 3 feet wide in most areas and generally has a clay/silt bottom. The upper reach of the channel is relatively flat and shallow, with the channel banks less than 2 feet tall. The middle and lower reaches are generally much more incised, with bank heights from 2 to 4 feet. Wetlands (Wetland A) are present along most of the channel length, except for parts of the middle reach where it is the most incised. The channel enters the study area through a culvert from the golf course, carries flows east to west, and flows out of the study area through large box culverts to its confluence with Coal Creek approximately 0.5 mile to the west.

North Unnamed Tributary Water Features: There are four other water features present in the North Unnamed Tributary, including three ponds and one channel below the seasonal spring (**Photos 10—17 in Appendix B**). All of the ponds (Ponds B, C, and D) are associated with the corresponding wetlands and appear to be hydrologically isolated as a result of the landfill downstream of the study area. They are all man-made and vary in depth. Depth of water during the field visit varied from 6 inches to approximately 3 feet. The ponds appear to be intermittent or ephemeral, and likely only fill with water seasonally or after major precipitation events. Ponds B and C appear to

Weld County 330 Acres

Wetland Delineation Report

be more regularly wet than Pond D. This is likely because they capture the surface flows first and only those flows big enough to spill out of Pond C make it to Pond D.

The channel in this tributary connects the seasonal spring to Pond B and is intermittent or ephemeral. There are substantial salt deposits present at the spring, along the flatter parts of the channel, and in Pond B (**Photos 16 and 17 in Appendix B**), indicating the evaporation of standing water. The channel has a clay bottom and is very narrow, with an average width of around 2 feet. It flows from east to west and terminates in Pond B.

There is a fourth old pond at the downstream end of the North Unnamed Tributary, but it does not hold water at a frequency or duration enough to be considered a water feature and has not been included.

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Wetland Delineation Report

6.0 Literature Cited

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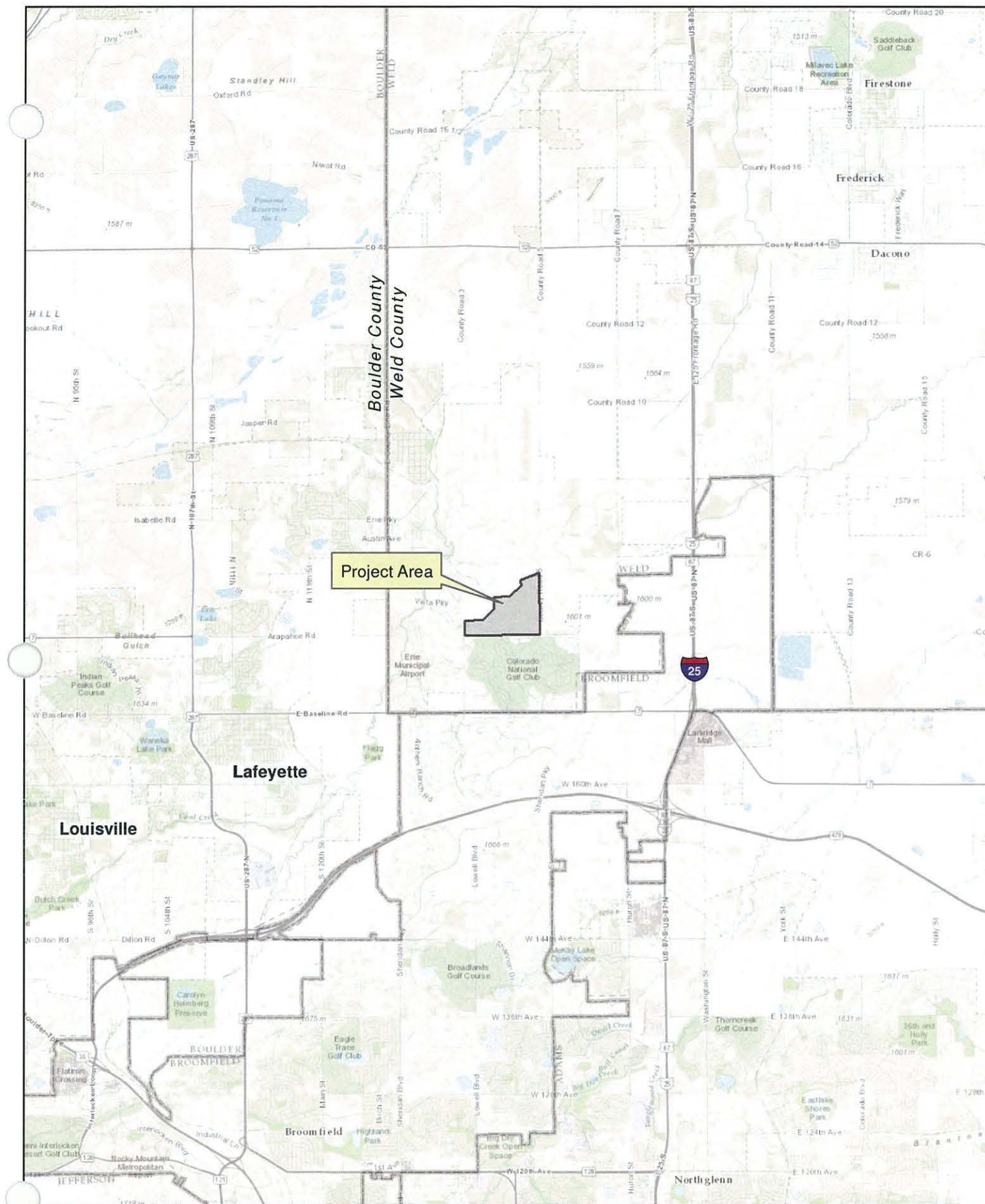
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0 0.5 1 2 3 Miles

Weld County 330 Acres

Figure 1
Location Map

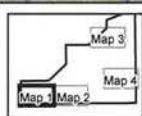
10/09/2014



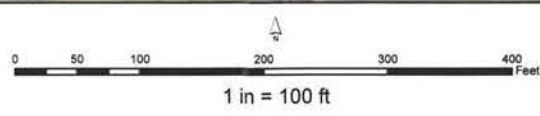
Weld County 330 Acres

Figure 2
Overview Map

10/10/2014



- Legend**
- ▶ Photo Point
 - * Sample Point
 - Other Water
 - Wetland

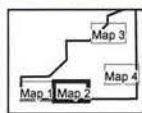


Weld County 330 Acres

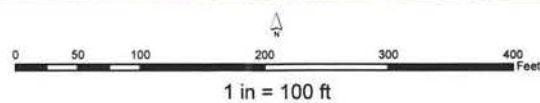
Figure 2
Wetlands
Map 1 of 4

10/14/2014





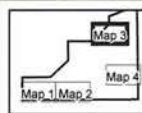
- Legend**
- ▶ Photo Point
 - x Sample Point
 - Other Water
 - Wetland



Weld County 330 Acres

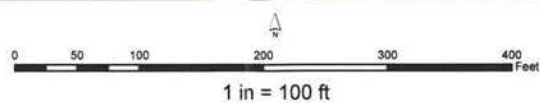
Figure 2
Wetlands
Map 2 of 4
10/14/2014





Legend

- ▶ Photo Point
- * Sample Point
- Other Water
- Wetland

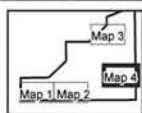


Weld County 330 Acres

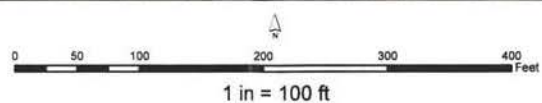
Figure 2
Wetlands
Map 3 of 4

10/14/2014





- Legend**
- ▶ Photo Point
 - ✱ Sample Point
 - Other Water
 - Wetland



Weld County 330 Acres

Figure 2
Wetlands
Map 4 of 4

10/14/2014



Appendix A
Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Wald City 330 acres City/County: Erie/Wald Sampling Date: 9/12/14
 Applicant/Owner: _____ State: CO Sampling Point: SP-A1
 Investigator(s): A. Herb Section, Township, Range: Sec 29, T1N, R68W
 Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1
 Subregion (LRR): W. Great Plains + Int. Land Lat: 40.016153 Long: -105.033655 Datum: NAD83
 Soil Map Unit Name: Colombo clay loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present?	Yes _____ No <input checked="" type="checkbox"/>		
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/> No _____		
Remarks: <u>Low-lying floodplain area w/ mix of mesic vegetation. Appears to receive overbank flows occasionally. No WL. Currently wet from significant rains.</u>			

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>0</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>0</u> (A/B)
1. _____				
2. _____				
3. _____				
4. _____				
_____ = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
Sapling/Shrub Stratum (Plot size: _____) 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ _____ = Total Cover				
Herb Stratum (Plot size: <u>1 x 3 m</u>) 1. <u>Elymus trachycanthus</u> <u>60</u> <u>Y</u> <u>FACU</u> 2. <u>Rumex crispus</u> <u>20</u> <u>Y</u> <u>FAC</u> 3. <u>Persicaria lapathifolia</u> <u>15</u> <u>N</u> <u>OBL</u> 4. <u>Atriplex patula</u> <u>5</u> <u>N</u> <u>FACW</u> 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____ _____ = Total Cover				
Woody Vine Stratum (Plot size: _____) 1. _____ 2. _____ _____ = Total Cover				
% Bare Ground in Herb Stratum <u>~0</u> _____ = Total Cover				
Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation ___ 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.				
Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>				
Remarks: <u>Edge of WL A - area flooded occasionally; mesic mix.</u>				

Sampling Point: SP-A1

HYDROLOGY

Primary Indicators (minimum of one required; check all that apply)

- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ (where not tilled)
- ☐ Presence of Reduced Iron (C4)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3)
(where tilled)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (LRR F)

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☒ No ☒ Depth (inches): _____

Saturation Present? Yes ☒ No ☐ Depth (inches): 0

(includes capillary fringe)

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections). If available:

Remarks: Saturated to surface - presumably from ^{pit} heavy recent rains. Area appears to occasionally receive overbank flows.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Weld Cty 330 acres City/County: Eric / Weld Sampling Date: 9/12/14
 Applicant/Owner: _____ State: CO Sampling Point: SP-A2
 Investigator(s): A. Herb Section, Township, Range: Sec 29, T1N, R68W
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): <1
 Subregion (LRR): W. Great Plains + Irig. Land Lat: 40.016178 Long: -105.033679 Datum: NAD83
 Soil Map Unit Name: Colombo Clay loam NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	
Remarks: <u>PEM wetland along South Unnamed tributary - mostly Typha</u>	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
1. _____				
2. _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
3. _____				
4. _____				
_____ = Total Cover				
Sapling/Shrub Stratum (Plot size: _____)				Hydrophytic Vegetation Indicators: 1 - Rapid Test for Hydrophytic Vegetation 2 - Dominance Test is >50% 3 - Prevalence Index is ≤3.0 ¹ 4 - Morphological Adaptations ² (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
1. _____				
2. _____				
3. _____				
4. _____				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____
5. _____				
6. _____				
7. _____				
8. _____				Remarks: <u>Dense PEM WL dominated by Typha. w/ Persicaria understory</u>
9. _____				
10. _____				
_____ = Total Cover				
Herb Stratum (Plot size: <u>1 x 3 m</u>)				
1. <u>Persicaria lapathifolia</u>	<u>60</u>	<u>Y</u>	<u>OBL</u>	
2. <u>Typha latifolia</u>	<u>30</u>	<u>Y</u>	<u>OBL</u>	
3. <u>Rumex crispus</u>	<u>5</u>	<u>N</u>	<u>FAC</u>	
4. <u>Schoenoplectus maritimus</u>	<u>2</u>	<u>N</u>	<u>OBL</u>	
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
_____ = Total Cover				
Woody Vine Stratum (Plot size: _____)				
1. _____				
2. _____				
_____ = Total Cover				
% Bare Ground in Herb Stratum <u>~0</u>				

SOIL

Sampling Point: SP-A2

[illegible]

HYDROLOGY

Wetland Hydrology Indicators:			Secondary Indicators (minimum of two required)	
Primary Indicators (minimum of one required; check all that apply)				
<input type="checkbox"/> Surface Water (A1) <input checked="" type="checkbox"/> High Water Table (A2) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Salt Crust (B11) <input type="checkbox"/> Aquatic Invertebrates (B13) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) (where not tilled) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) (where tilled) <input checked="" type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> FAC-Neutral Test (D5) <input type="checkbox"/> Frost-Heave Hummocks (D7) (LRR F)		
Field Observations:				
Surface Water Present?	Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):		
Water Table Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Depth (inches):	6	
Saturation Present? (includes capillary fringe)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Depth (inches):	0	
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:			Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Remarks: <i>Surface water (in channel of South Tributary) w/in ~ 5' - source of WL hydrology is tributary - via capillary action + overbank flow</i>				

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Weld Cty 330 acres City/County: Erie/Weld Sampling Date: 9/12/14
 Applicant/Owner: — State: CO Sampling Point: SP-A3
 Investigator(s): A. Herb Section, Township, Range: Sec 29, T1N, R68W
 Landform (hillslope, terrace, etc.): florid plain Local relief (concave, convex, none): concave Slope (%): <1
 Subregion (LRR): W. Great Plains + Intq. Land Lat: 40.015583 Long: -105.029366 Datum: NAD83
 Soil Map Unit Name: Colombo clay loam NWI classification: —

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
 Are Vegetation —, Soil —, or Hydrology — significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation —, Soil —, or Hydrology — naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Remarks: <u>Small UPL island associated w/ South Unnamed Tributary. Occasionally flooded but not wetland.</u>	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>—</u>)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>50</u> (A/B)
1. <u>—</u>				
2. <u>—</u>				
3. <u>—</u>				
4. <u>—</u>				
= Total Cover				Prevalence Index worksheet: Total % Cover of: <u>—</u> Multiply by: OBL species <u>—</u> x 1 = <u>—</u> FACW species <u>—</u> x 2 = <u>—</u> FAC species <u>—</u> x 3 = <u>—</u> FACU species <u>—</u> x 4 = <u>—</u> UPL species <u>—</u> x 5 = <u>—</u> Column Totals: <u>—</u> (A) <u>—</u> (B) Prevalence Index = B/A = <u>—</u>
Sapling/Shrub Stratum (Plot size: <u>—</u>)				
1. <u>—</u>				
2. <u>—</u>				
3. <u>—</u>				
4. <u>—</u>				
5. <u>—</u>				
= Total Cover				
Herb Stratum (Plot size: <u>1 x 3 m</u>)				Hydrophytic Vegetation Indicators: 1 - Rapid Test for Hydrophytic Vegetation 2 - Dominance Test is >50% 3 - Prevalence Index is ≤3.0 ¹ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
1. <u>Cirsium arvense</u>	<u>60</u>	<u>Y</u>	<u>FACU</u>	
2. <u>Atriplex patula</u>	<u>20</u>	<u>Y</u>	<u>FACW</u>	
3. <u>Rumex crispus</u>	<u>5</u>	<u>N</u>	<u>FAC</u>	
4. <u>Typha latifolia</u>	<u>5</u>	<u>N</u>	<u>OBL</u>	
5. <u>—</u>				
6. <u>—</u>				
7. <u>—</u>				
8. <u>—</u>				
9. <u>—</u>				
10. <u>—</u>				
= Total Cover				
Woody Vine Stratum (Plot size: <u>—</u>)				Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
1. <u>—</u>				
2. <u>—</u>				
= Total Cover				
% Bare Ground in Herb Stratum <u>~5-10</u>				
Remarks: <u>Weedy upland island surrounded by mostly Typha dominated WL.</u>				

SOIL

Sampling Point: SP-A3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-18	10YR 3/3	100	—	—	—	—	silty clay	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

Indicators for Problematic Hydric Soils³:

- ☐ Histosol (A1)
☐ Histic Epipedon (A2)
☐ Black Histic (A3)
☐ Hydrogen Sulfide (A4)
☐ Stratified Layers (A5) (LRR F)
☐ 1 cm Muck (A9) (LRR F, G, H)
☐ Depleted Below Dark Surface (A11)
☐ Thick Dark Surface (A12)
☐ Sandy Mucky Mineral (S1)
☐ 2.5 cm Mucky Peat or Peat (S2) (LRR G, H)
☐ 5 cm Mucky Peat or Peat (S3) (LRR F)

- ☐ Sandy Gleyed Matrix (S4)
☐ Sandy Redox (S5)
☐ Stripped Matrix (S6)
☐ Loamy Mucky Mineral (F1)
☐ Loamy Gleyed Matrix (F2)
☐ Depleted Matrix (F3)
☐ Redox Dark Surface (F6)
☐ Depleted Dark Surface (F7)
☐ Redox Depressions (F8)
☐ High Plains Depressions (F16)
 (MLRA 72 & 73 of LRR H)

- ☐ 1 cm Muck (A9) (LRR I, J)
☐ Coast Prairie Redox (A16) (LRR F, G, H)
☐ Dark Surface (S7) (LRR G)
☐ High Plains Depressions (F16)
 (LRR H outside of MLRA 72 & 73)
☐ Reduced Vertic (F18)
☐ Red Parent Material (TF2)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

 Type: —
 Depth (inches): —
Hydric Soil Present? Yes No ✓

Remarks:

No indicators

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
☐ High Water Table (A2)
☐ Saturation (A3)
☐ Water Marks (B1)
☐ Sediment Deposits (B2)
☐ Drift Deposits (B3)
☐ Algal Mat or Crust (B4)
☐ Iron Deposits (B5)
☐ Inundation Visible on Aerial Imagery (B7)
☐ Water-Stained Leaves (B9)

- ☐ Salt Crust (B11)
☐ Aquatic Invertebrates (B13)
☐ Hydrogen Sulfide Odor (C1)
☐ Dry-Season Water Table (C2)
☐ Oxidized Rhizospheres on Living Roots (C3)
 (where not tilled)
☐ Presence of Reduced Iron (C4)
☐ Thin Muck Surface (C7)
☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
☐ Sparsely Vegetated Concave Surface (B8)
☐ Drainage Patterns (B10)
☐ Oxidized Rhizospheres on Living Roots (C3)
 (where tilled)
☐ Crayfish Burrows (C8)
☐ Saturation Visible on Aerial Imagery (C9)
☐ Geomorphic Position (D2)
☐ FAC-Neutral Test (D5)
☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

 Surface Water Present? Yes No ✓ Depth (inches):
 Water Table Present? Yes No ✓ Depth (inches):
 Saturation Present? Yes No ✓ Depth (inches):
 (includes capillary fringe)
Wetland Hydrology Present? Yes No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology indicators; island ~ 1-1.5' above wetland

SOIL

Sampling Point: SP-B1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-18	2.5y5/3	60	2.5y5/1	40	C	M	silty clay	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

<input type="checkbox"/> Histosol (A1) <input type="checkbox"/> Histic Epipedon (A2) <input type="checkbox"/> Black Histic (A3) <input checked="" type="checkbox"/> Hydrogen Sulfide (A4) <input type="checkbox"/> Stratified Layers (A5) (LRR F) <input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H) <input type="checkbox"/> Depleted Below Dark Surface (A11) <input type="checkbox"/> Thick Dark Surface (A12) <input type="checkbox"/> Sandy Mucky Mineral (S1) <input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) <input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F)	<input type="checkbox"/> Sandy Gleyed Matrix (S4) <input type="checkbox"/> Sandy Redox (S5) <input type="checkbox"/> Stripped Matrix (S6) <input type="checkbox"/> Loamy Mucky Mineral (F1) <input type="checkbox"/> Loamy Gleyed Matrix (F2) <input type="checkbox"/> Depleted Matrix (F3) <input type="checkbox"/> Redox Dark Surface (F6) <input type="checkbox"/> Depleted Dark Surface (F7) <input type="checkbox"/> Redox Depressions (F8) <input type="checkbox"/> High Plains Depressions (F16) (MLRA 72 & 73 of LRR H)	Indicators for Problematic Hydric Soils³: <input type="checkbox"/> 1 cm Muck (A9) (LRR I, J) <input type="checkbox"/> Coast Prairie Redox (A16) (LRR F, G, H) <input type="checkbox"/> Dark Surface (S7) (LRR G) <input type="checkbox"/> High Plains Depressions (F16) (LRR H outside of MLRA 72 & 73) <input type="checkbox"/> Reduced Vertic (F18) <input type="checkbox"/> Red Parent Material (TF2) <input type="checkbox"/> Very Shallow Dark Surface (TF12) <input type="checkbox"/> Other (Explain in Remarks) ³ Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.
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Restrictive Layer (if present):

Type: _____	Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____
Depth (inches): _____	

Remarks: H₂S in both layers ; also may be some contaminated soil - possibly a hydrocarbon smell

HYDROLOGY

Wetland Hydrology Indicators:		
<div> <div>Primary Indicators (minimum of one required; check all that apply)</div> <div> <div> <input type="checkbox"/> Surface Water (A1) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input checked="" type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input checked="" type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) </div> <div> <input checked="" type="checkbox"/> Salt Crust (B11) <input type="checkbox"/> Aquatic Invertebrates (B13) <input checked="" type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) (where not tilled) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Other (Explain in Remarks) </div> </div> </div> <div> <div>Secondary Indicators (minimum of two required)</div> <div> <input checked="" type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) (where tilled) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> FAC-Neutral Test (D5) <input type="checkbox"/> Frost-Heave Hummocks (D7) (LRR F) </div> </div>		
<div>Field Observations:</div> <div> <div> <div>Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></div> <div>Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></div> <div>Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></div> </div> <div> <div>Depth (inches): <input type="text"/></div> <div>Depth (inches): <input type="text"/></div> <div>Depth (inches): <input type="text" value="0"/></div> </div> </div> <div> <div>Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></div> </div>		
<div>Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:</div> <div>2013 aerial photo - inundated</div>		
<div>Remarks: Uppermost pond in unnamed Trib (North); WL hydrology from ponding surface flows, incl. discharge from seasonal spring</div>		

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Wald Cty 330 acres City/County: Eric/Wald Sampling Date: 9/16/14
 Applicant/Owner: - State: CO Sampling Point: SP-B2
 Investigator(s): A. Herb Section, Township, Range: Sec 29, T1N, R68W
 Landform (hillslope, terrace, etc.): pond/depression Local relief (concave, convex, none): Concave Slope (%): <1
 Subregion (LRR): W. Great Plains + Irrig. Land Lat: 40.023875 Long: -105.021561 Datum: NAD83
 Soil Map Unit Name: Midway - Shingle Complex NWI classification: -
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Hydric Soil Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Wetland Hydrology Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Remarks: <u>Edge of pond - occasionally flooded</u>		

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>0</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>0</u> (A/B)
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
_____ = Total Cover				Hydrophytic Vegetation Indicators: 1 - Rapid Test for Hydrophytic Vegetation 2 - Dominance Test is >50% 3 - Prevalence Index is ≤3.0 ¹ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic. Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Sapling/Shrub Stratum (Plot size: _____)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
_____ = Total Cover				
Herb Stratum (Plot size: <u>1 x 3m</u>)				
1. <u>Convolvulus arvensis</u>	<u>30</u>	<u>Y</u>	<u>UPL</u>	
2. <u>Bassia scoparia</u>	<u>30</u>	<u>Y</u>	<u>FACU</u>	
3. <u>Solanum triflorum</u>	<u>10</u>	<u>N</u>	<u>UPL</u>	
4. <u>Rumex crispus</u>	<u>5</u>	<u>N</u>	<u>FAC</u>	
5. <u>Verbena bracteata</u>	<u>2</u>	<u>N</u>	<u>FACU</u>	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
_____ = Total Cover				
Woody Vine Stratum (Plot size: _____)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
_____ = Total Cover				
% Bare Ground in Herb Stratum <u>~20-25</u>				
Remarks: <u>Weedy upland edge of pond</u>				

SOIL

Sampling Point: SP-B2

[illegible]

HYDROLOGY

Wetland Hydrology Indicators:		
Primary Indicators (minimum of one required; check all that apply)		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Salt Crust (B11)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Invertebrates (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Dry-Season Water Table (C2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	(where tilled)
<input type="checkbox"/> Drift Deposits (B3)	(where not tilled)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> FAC-Neutral Test (D5)
<input type="checkbox"/> Water-Stained Leaves (B9)		<input type="checkbox"/> Frost-Heave Hummocks (D7) (LRR F)
Field Observations:		
Surface Water Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches): _____
Water Table Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches): _____
		Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Inundation visible on 2013 aerial (after huge rain events)		
Remarks: Occasionally flooded - when pond at its fullest - but no WL hydrology		

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Weld City 330 acres City/County: Eric/Weld Sampling Date: 9/16/14
 Applicant/Owner: _____ State: CO Sampling Point: SP-41
 Investigator(s): A. Harb Section, Township, Range: Sec 29, T1N, R68W
 Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): concave Slope (%): 1-2
 Subregion (LRR): W. Great Plains + Eng. Land Lat: 40.017718 Long: -105.018440 Datum: NAD83
 Soil Map Unit Name: Ulm clay loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	
Remarks: <u>Swale vegetated w/ mesic mix of species. Occasional surface flows but no WC.</u>	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>50</u> (A/B)
1. _____				
2. _____				
3. _____				
4. _____				
_____ = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
Sapling/Shrub Stratum (Plot size: _____)				
1. _____				
2. _____				
3. _____				
4. _____				
5. _____				
_____ = Total Cover				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation ___ 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
Herb Stratum (Plot size: <u>1x3m</u>)				
1. <u>Rumex crispus</u>	<u>30</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Helianthus annuus</u>	<u>25</u>	<u>Y</u>	<u>FACU</u>	
3. <u>Coryza canadensis</u>	<u>5</u>	<u>N</u>	<u>UPL</u>	
4. <u>Typha latifolia</u>	<u>5</u>	<u>N</u>	<u>OBL</u>	
5. <u>Hordeum jubatum</u>	<u>2</u>	<u>N</u>	<u>FACW</u>	
6. <u>Panicum capillare</u>	<u>2</u>	<u>N</u>	<u>FAC</u>	
7. _____				
8. _____				
9. _____				
10. _____				
_____ = Total Cover <u>35/14</u>				Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>
Woody Vine Stratum (Plot size: _____)				
1. _____				
2. _____				
_____ = Total Cover				
% Bare Ground in Herb Stratum <u>~30</u>				
Remarks: <u>Mesic mix in bottom of swale; scattered Typha</u>				

SOIL

Sampling Point: SP-U1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4	10YR3/2	100	—	—	—	—	Silty clay - ox rhizos	
4-16	10YR4/2	100	—	—	—	—	Silty clay - No ox rhizos	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)		Indicators for Problematic Hydric Soils ³ :
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> 1 cm Muck (A9) (LRR I, J)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Coast Prairie Redox (A16) (LRR F, G, H)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Dark Surface (S7) (LRR G)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Mucky Mineral (F1)	<input type="checkbox"/> High Plains Depressions (F16)
<input type="checkbox"/> Stratified Layers (A5) (LRR F)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> (LRR H outside of MLRA 72 & 73)
<input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Reduced Vertic (F18)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)
<input type="checkbox"/> Sandy Mucky Mineral (S1)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H)	<input type="checkbox"/> High Plains Depressions (F16)	³ Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.
<input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F)	<input type="checkbox"/> (MLRA 72 & 73 of LRR H)	

Restrictive Layer (if present):

Type: —

Depth (inches): —

Hydric Soil Present? Yes — No ☒

Remarks: No hydric soil indicators

HYDROLOGY

Wetland Hydrology Indicators:		Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one required; check all that apply)		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Salt Crust (B11)	<input checked="" type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Invertebrates (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Dry-Season Water Table (C2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> (where tilled)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> (where not tilled)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> FAC-Neutral Test (D5)
<input type="checkbox"/> Water-Stained Leaves (B9)		<input type="checkbox"/> Frost-Heave Hummocks (D7) (LRR F)
Field Observations:		
Surface Water Present? Yes <u>—</u> No <input checked="" type="checkbox"/>	Depth (inches): <u>—</u>	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <u>—</u>
Water Table Present? Yes <u>—</u> No <input checked="" type="checkbox"/>	Depth (inches): <u>—</u>	
Saturation Present? Yes <u>—</u> No <input checked="" type="checkbox"/>	Depth (inches): <u>—</u>	
(includes capillary fringe)		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks: <u>Two secondary indicators obs. Receives occasional surface flows from landfill to east</u>		

Appendix B

Site Photographs



Photo 1: Wetland A, looking northeast from Vista Parkway (upstream)



Photo 2: Wetland A, looking northeast (upstream)



Photo 3: Wetland A, looking north (downstream)

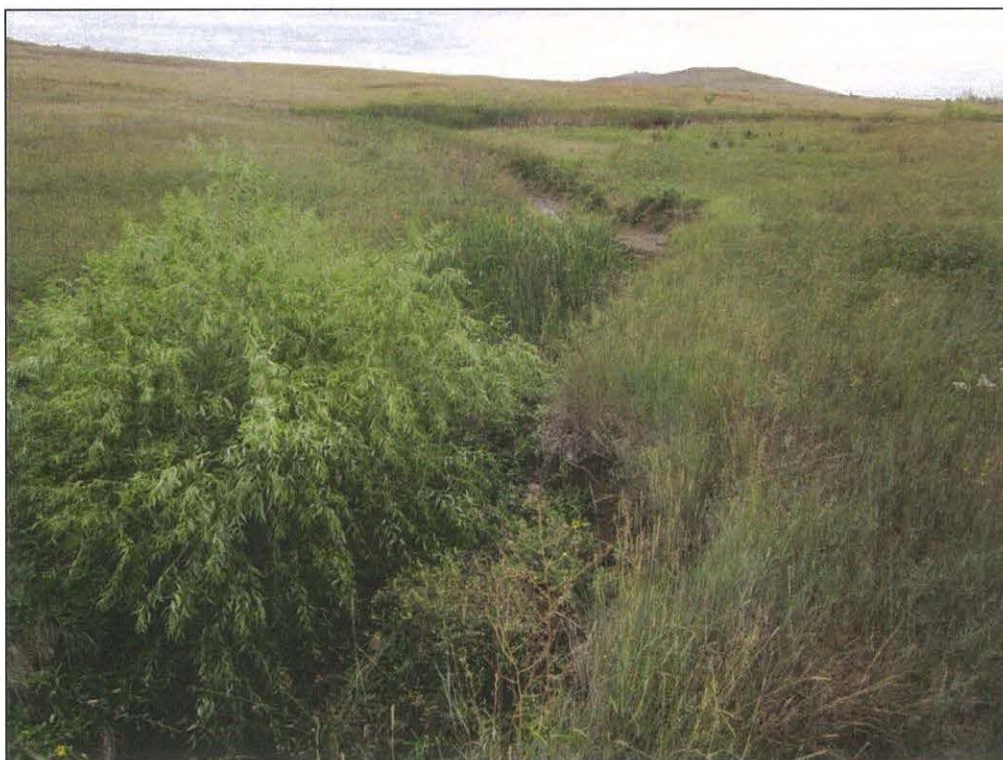


Photo 4 : Wetland A, looking east (upstream)



Photo 5: Wetland A, looking southwest (downstream)



Photo 6: Wetland A, looking north at SP-A1 (double flag in foreground) and SP-A2 (double flag in background)



Photo 7: Wetland A, looking southeast (upstream)



Photo 8: Upland sample point (SP-A3) adjacent to Wetland A, looking southeast



Photo 9: Wetland A, looking north from golf course (downstream)



Photo 10: Wetland and Pond B, looking southwest



Photo 11: Wetland and Pond B, looking southwest at SP-B2 (double flag)



Photo 12: Wetland and Pond C, looking southwest from the Pond B dam



Photo 13: Wetland and Pond B, looking northeast



Photo 14: Pond C, looking southwest from the inlet



Photo 15: Wetland below Pond C, looking northeast



Photo 16: Start of Channel B (at spring; marked by shovel), looking west



Photo 17: Channel B between spring and Pond B, looking southwest



Photo 18: Upland sample point (SP-U1), looking southwest



CLOSURE CERTIFICATION REPORT

PRATT PROPERTY BURIED TRASH REMOVAL AND DISPOSAL PROJECT

PROPOSED SETTLEMENT

ESA No. 15-9-30-1

FILE: SW WLD PRA 1.6

December 21, 2015

A handwritten signature in black ink, appearing to read "Mike Cugnetti", written over a horizontal line.

12-28-2015

Project Manager
Mike Cugnetti
Manager, Field Environmental
Encana Services Company Ltd.
encana.com

Encana Services Company Ltd.

Republic Plaza - 370 17th Street, Suite 1700, Denver, CO 80202 **encana.com**

Encana Services Company Ltd. provides operational, corporate, administrative and advisory services to Encana Corporation and its subsidiaries.

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ATTACHMENTS:

- Attachment 1: Site Location Map
- Attachment 2: Photographs
- Attachment 3: Waste Tire Disposal Receipts
- Attachment 4: CABI Invoice
- Attachment 5: Closure Plan

1.0 INTRODUCTION

Encana Services Company Ltd. entered into Settlement Agreement 15-09-30-1 (the Agreement) to establish compliance schedules and requirements for the closure of the pipeline Right Of Way (ROW) trench where buried trash was encountered near the intersection of Weld County Roads 5 and 6 near Erie, Colorado. A Closure Plan was developed to satisfy condition 2 of the Agreement. The Closure Plan included procedures for removing buried trash from the pipeline ROW, depositing the trash at the Front Range Landfill, a Soil Characterization and Management Plan (SMP), treatment required for special wastes, installing the pipeline and reclaiming the ROW. The Closure Plan was submitted to and approved by Colorado Department of Public Health and Environment (CDPHE) on November 3, 2015. The Closure Plan was utilized to remove and dispose of the buried trash. This Closure Report presents the description of the project work, observations and results of the excavation project.

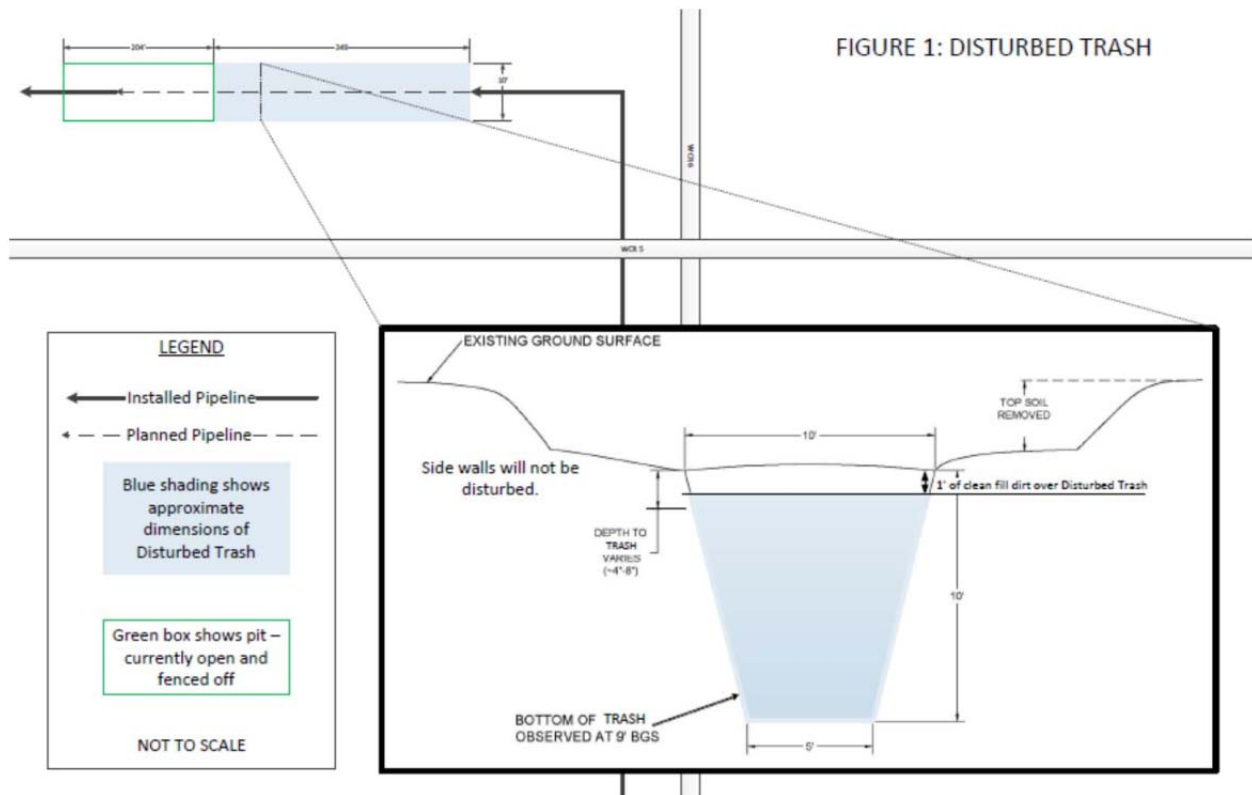
2.0 PURPOSE AND SCOPE

From December 1-2, 2015, buried trash was excavated near the intersection of Weld County Roads 5 and 6 near Erie, Colorado and properly disposed of according to procedures outlined in a Closure Plan approved by CDPHE on November 3, 2015. This Closure Report provides information and documentation associated with field operations during the completion of this project. Specifically, this Closure Report includes:

- A description of the field operations for the project
- Special waste encountered
- Disposal manifests or delivery receipts
- A description of suspected asbestos-containing materials (ACM)
- Load summaries of the excavated waste
- Photo documentation associated with the project

3.0 LOCATION DESCRIPTION

The site location for the buried trash location is illustrated in Figure 1.



4.0 DESCRIPTION OF FIELD OPERATIONS

The buried trash excavation project and pipeline installation at the Pratt Property began on November 30, 2015 and was completed on December 11, 2015. A total of 80 loads of materials primarily trash and soils were removed from the ROW and transported to the Front Range Landfill for disposal. The weather was good every day, and wind speeds were low so blowing trash was not an issue. The ground conditions were impacted by melting snow cover which moistened the soils, keeping dust conditions nonexistent.

The roadway used to transport the waste materials to the landfill was protected by tracking pads and serviced by a street sweeper as needed.

There were no complaints about the traffic or blown debris.

November 30, 2015

To start the project, a daily tailgate health and safety meeting was conducted in the field along with a general description of how the activities would occur at the site. After the meeting, site preparation began by removing improving the tracking pad placing an entrance to the north of the ROW and a temporary gravel road to along the ROW.

December 1, 2015

After the daily tailgate safety meeting, the trenching began. Trash and soils were excavated using an excavator. As the excavator picked up a bucket

of trash and soil, the materials were visually inspected by the Certified Asbestos Building Inspector (CABI) and Qualified Environmental Specialist (QES). The CABI and QES also observed the trash and soil being unloaded from the bucket into the transport vehicle (truck). This method provided the best observation of the waste materials as they were excavated and loaded into the transport vehicle. The transport vehicles used were various-sized dump trucks. On the first day of operations, approximately one third of the trench length was removed and transported to the Front Range Landfill. The excavation was deep enough, 8-10 feet, to expose a floor of native soils. Photographs in Attachment 2 demonstrate the depth of the excavation areas. No evidence of Asbestos Containing Materials was seen. Ninety tires were discovered and separated for proper disposal at Big O tires in Longmont. No other special waste was observed.

December 2, 2015

Excavation activities continued on the second day. Trash and soil were placed directly into the transport vehicles. The trenching continued and was completed on Dec. 2, 2015. A total of 80 loads were taken to the Front Range Landfill. Another 55 tires were discovered, separated and taken to Big O tire in Longmont for disposal. No other special waste or ACM was observed.

December 3-11, 2015

No other trash disturbing activities were to occur, so the CABI and QES were not on-site for the remaining work. The trench was partially refilled with clean fill dirt and compacted. The pipeline was laid in the trench and connected. The rest of the trench was then filled with clean fill dirt and compacted. Top soil was replaced in the trench area. Seeding will be done early spring.

5.0 LOAD SUMMARY

The totals for the waste excavation and removal project are 80 dump truck loads of excavated trash and soil from ROW to Front Range Landfill and two loads of 90 and 55 tires were taken to Big O Tires in Longmont.

6.0 DESCRIPTION OF KNOWN, SUSPECT, OR UNEXPECTED RACS AND/OR ACM

No suspected ACM or RACS was observed.

7.0 VISUAL OBSERVATIONS DURING EXCAVATION ACTIVITIES

During waste material excavations, the working face and scoops were continually inspected for special waste materials, soil staining, soil discoloration, and general characteristics of the remaining soils.

Additionally, soils samples were periodically collected from the working face during excavation Activities and checked for volatile organics using a photoionization detector (PID); no PID meter readings occurred at any of the sampling locations throughout the duration of the project.

7.1 Containers

No intact containers were observed.

7.2 Contaminated soil

Excavator scoops were continually inspected for soil staining, soil discoloration, and general characteristics of the remaining soils. No evidence of contaminated soil was observed. Additionally, soils samples were periodically collected from the working face during excavation Activities and checked for volatile organics using a photoionization detector (PID); no PID meter reading occurred at any of the sampling locations throughout the duration of the project.

7.3 Medical Waste

There were no signs of any medical waste in the materials removed. There were no red bags that would indicate medical waste and no syringes, gauze dressings, or other materials typical of medical waste observed.

7.4 PCB Waste

PCB waste was not observed in the excavated waste materials. There were no light ballasts or transformers identified in any of the excavated waste.

7.5 Hazardous Waste

No containers identified with hazardous waste labels or containers filled with liquids were observed during excavation activities.

7.6 Electronic Waste

There were no signs of any electronic waste in the removed.

7.7 Waste Tires

A total of 145 waste tires were discovered segregated and taken to Big-O tire in Longmont for disposal.

7.8 Lead Acid Batteries

No batteries were observed.

8.0 POST-EXCAVATION VISUAL SITE RECONNAISSANCE

After excavation activities were complete, a visual reconnaissance was conducted on all areas where waste was encountered and excavated. Any trash on the surface was hand-picked and disposed.

9.0 CURRENT STATUS OF ROW

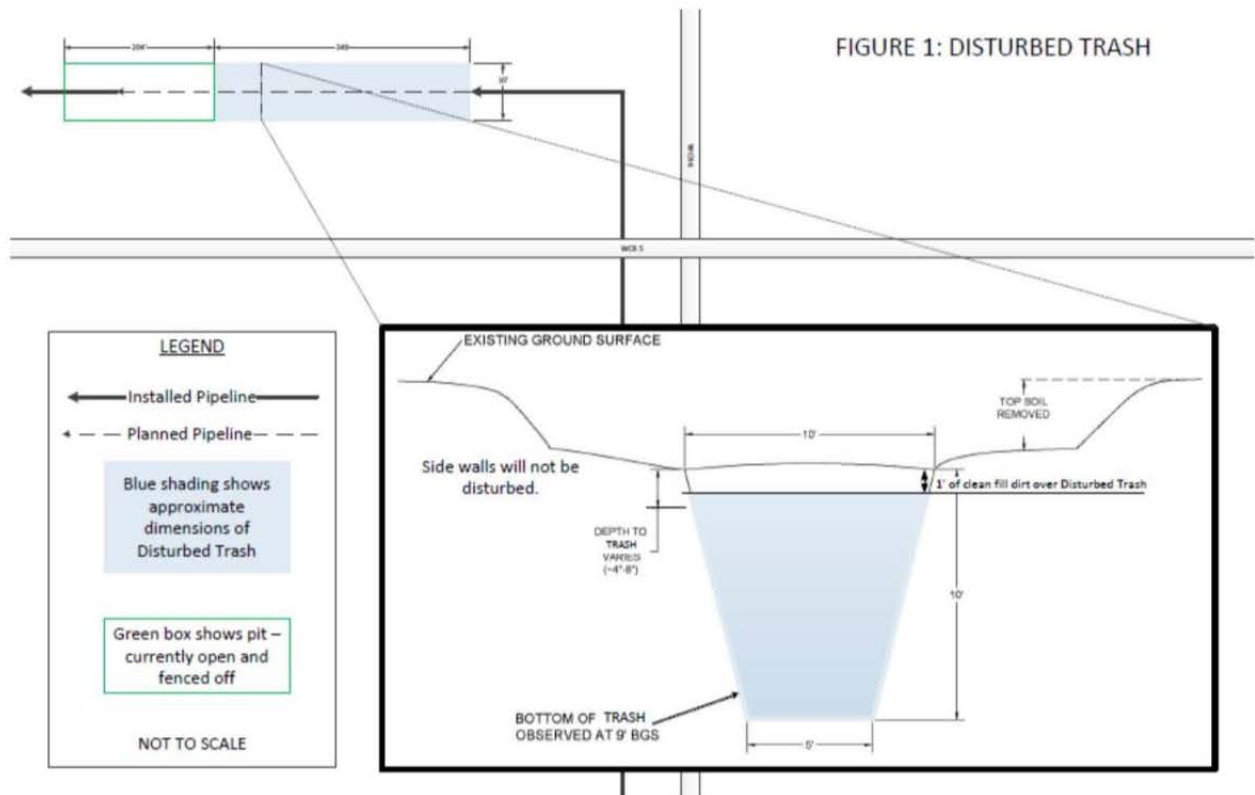
Following the completion of excavation, the pipeline was laid connected and the trench was refilled with clean fill dirt, compacted and covered with topsoil.

10.0 CONCLUSION AND RECOMMENDATION

Excavation and disposal of waste materials from the pipeline trench were conducted according to the procedures outlined in the CDPHE approved Closure Plan. Following the excavation and disposal of waste materials from the trench, the site was returned to the condition we found it in or better. Encana respectfully requests closure status approval from CDPHE for the Pratt Property pipeline ROW.

Attachment 1

Site Location Map



Attachment 2

Photographs

ROW during trash removal and disposal











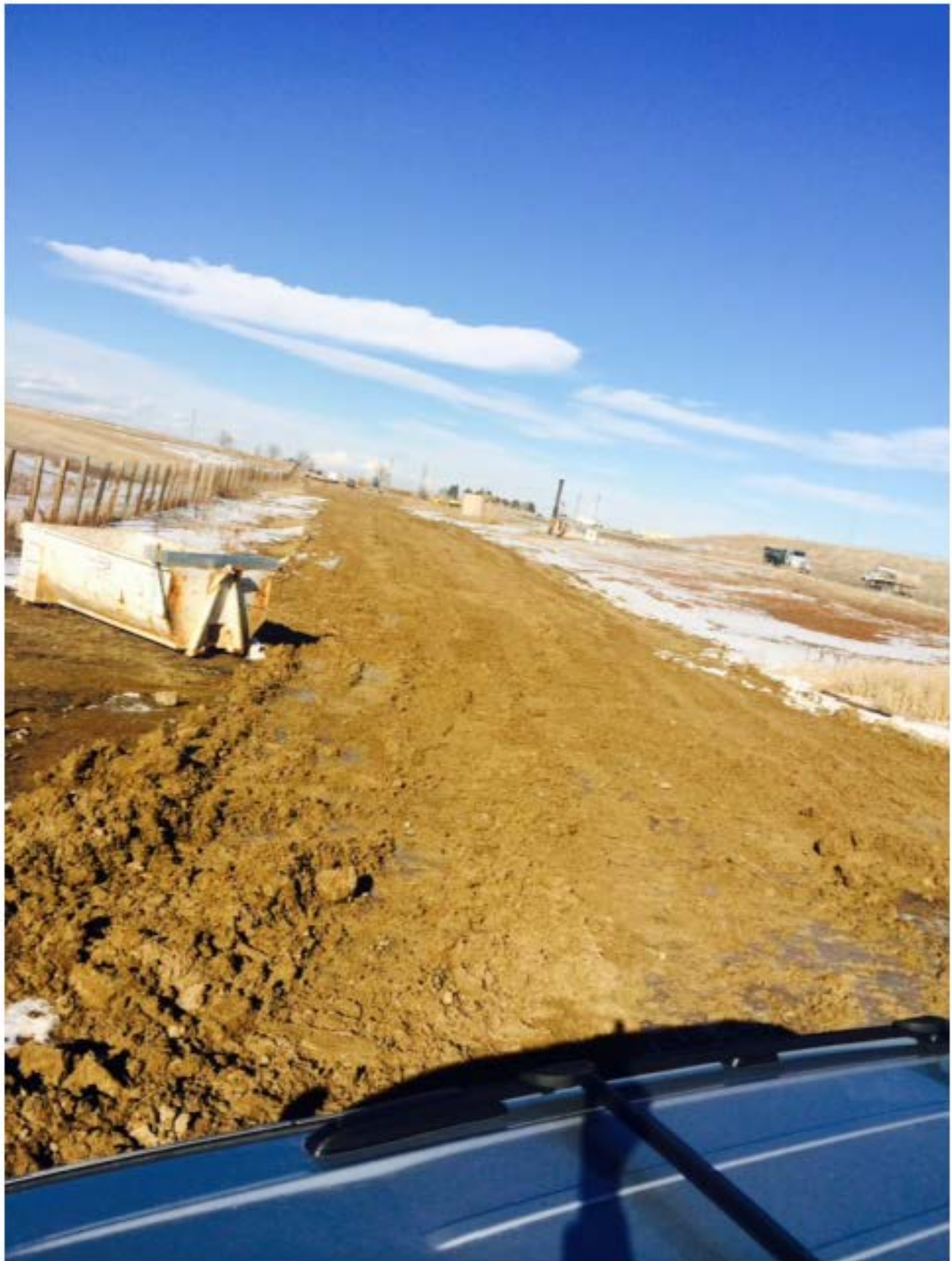






ROW post fill







Attachment 3

Waste Tire Disposal Receipts

INVOICE

BIG O TIRES # 6125
1205 S MAIN ST
LONGMONT, CO 80501
(303) 772-1462



Visit us on the web at: www.bigotires.com

Invoice No: 006125-153016

Page 1

Order No: 167442

Date: 12/01/2015

Time: 03:34 PM

Started by: SEAN PRESSLER

Invoiced by: SEAN PRESSLER

Vehicle Information

NO VEHICLE

Cust.: ENCANA OIL GAS 6125-237973

Address: 3601 STAGECOACH RD

City, State, Zip: LONGMONT, CO 80504-5658

Phone: (970) 309-7510 Alt Ph:

Cell: (720) 201-5877

Bill To:

Customer Instructions

Save Old Parts? No

Part No.	Description	Technician	Qty	Unit Price	Total Price
FEE FEETD	TIRE DISPOSAL FEE		90.00	2.25	202.50

Invoice Summary

Payment		Invoice Totals	
Type	Amount		
VISA FLEET	\$202.50	Parts	0.00
****4116 Auth		FET	0.00
022482		Core Chg	0.00
		Labor	0.00
		Waste Disposal	202.50
		Shop Supplies	0.00
		Sales Tax	0.00
		Total:	202.50

I have received the above goods and/or services. If this is a credit card purchase, I agree to pay and comply with the cardholders agreement with the issuer.
There are no cancellations allowed.

Customer

INVOICE

BIG O TIRES # 6125
1205 S MAIN ST
LONGMONT, CO 80501
(303) 772-1462



Visit us on the web at: www.bigotires.com

Invoice No: 006125-153086

Page 1

Order No: 167520

Date: 12/02/2015

Time: 03:16 PM

Started by: SEAN PRESSLER

Invoiced by: SEAN PRESSLER

Vehicle Information

NO VEHICLE

Cust.: CASH 6125-259686

Address:

City, State, Zip: , CO

Phone:

Alt Ph:

Cell:

Bill To:

Customer Instructions

Save Old Parts? No

Part No.	Description	Technician	Qty	Unit Price	Total Price
FEE FEETD	TIRE DISPOSAL FEE		55.00	2.25	123.75

Invoice Summary

Payment		Invoice Totals	
Type	Amount		
VISA ****4116 Auth 080902	\$123.75	Parts	0.00
		FET	0.00
		Core Chg	0.00
		Labor	0.00
		Waste Disposal	123.75
		Shop Supplies	0.00
		Sales Tax	0.00
		Total:	123.75

I have received the above goods and/or services. If this is a credit card purchase, I agree to pay and comply with the cardholders agreement with the issuer.
There are no cancellations allowed.

Customer
Signature

Attachment 4

CABI Invoice




Koch Environmental Health, Inc.
 PO Box 253
 Morrison, CO 80465
 (303) 932-8484
 www.kochenvironmental.com

Date	Invoice #
12/10/2015	05050001-02

Bill To
Encana Services Company, Ltd. Tarah Garza

P.O. No.	Terms	Project
	Due on receipt	05050-001, Weld County Roads 5 & 6

Quantity	Description	Rate	Amount
9	Industrial Hygienist, hourly rate - Weld County Roads 5&6, Meetings and Prep (November 17 through November 23, 2015) (Mike Mithun & John F. Lynch, III)	75.00	675.00
2	Industrial Hygienist, daily rate - Weld County Roads 5&6, Meetings and Prep December 1 & 2, 2015) (Mike Mithun & John F. Lynch, III)	750.00	1,500.00
150	Site Mileage (November 19 & December 1&2, 2015)	0.68	102.00
 12-14-15			
Thank you for your business.		Total	\$2,277.00

Attachment 5 - Closure Plan



CLOSURE PLAN OCTOBER 27, 2015

BACKGROUND

In November 2014, Encana Oil & Gas (USA) Inc. (“Encana”) unexpectedly encountered and disturbed buried trash while conducting pipeline trenching operations in Encana’s right-of-way located to the southwest of the intersection of county roads 5 and 6 in Erie, Colorado (the “Project Location”). This Closure Plan outlines the methods and procedures Encana will use to remove and dispose of the approximately 900 cubic yards of buried trash Encana previously disturbed as depicted in Figure 1 (the “Disturbed Trash”).

TRASH REMOVAL AND DISPOSAL

Trenching and trash removal work at the Project Location will begin within sixty days of execution of the Early Settlement Agreement. The work will be conducted by Encana’s contractor. The trench will be reopened and the Disturbed Trash will be removed using excavators and placed directly into dump trucks for transportation to the Front Range Landfill, or another appropriately certified landfill, for disposal. The Disturbed Trash has been profiled under Waste Connections profile number, FRL15-015.

Once the Disturbed Trash is removed, Encana will install and connect Encana’s pipeline. The trench will then be backfilled with clean fill dirt, compacted, and the area will be reclaimed in compliance with applicable COGCC regulations. Encana will then submit a Closure Certification Report to the Division within 30 days of completion.

This work will be done under the observation of an onsite Certified Asbestos Building Inspector (“CABI”), provided by Koch Environmental.

WASTE OUTSIDE SCOPE OF DISTURBED TRASH PROFILE

In the event that waste types outside the scope of the Disturbed Trash profile are encountered (suspect liquids, hazardous waste, PCB waste, electronic waste, medical waste, tires or batteries), the waste will be segregated in an impervious container, characterized, handled and disposed of appropriately and in compliance with applicable regulations as described on Attachment A attached hereto and incorporated herein.

SOIL CHARACTERIZATION AND MANAGEMENT PLAN (SMP)

If non-friable or friable ACM is detected in the immediate area, all work will stop and Encana will contact CDPHE. A Soil Characterization and Management Plan (“SMP”) prepared by Koch Environmental will be available as a contingency plan if asbestos is detected (Attachment B).



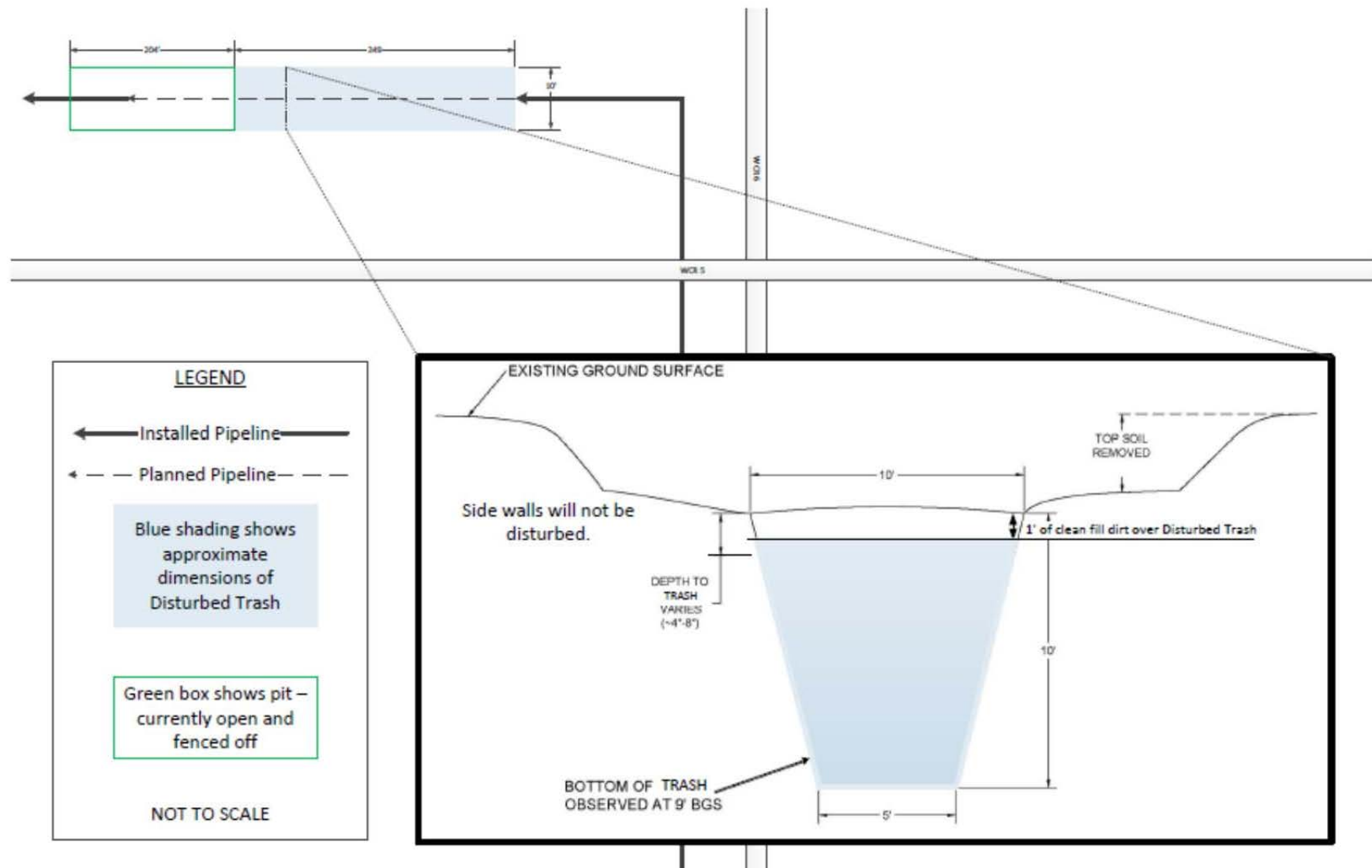
UNFORESEEN CIRCUMSTANCES OR EVENTS

If unforeseen circumstances or events prevent Encana's removal of the Disturbed Trash in a timely manner, Encana will leave the remaining Disturbed Trash in situ, contact CDPHE, and seek to reach a mutual agreement with regard to an alternative solution.

Questions regarding this Closure Plan may be directed to Mike Cugnetti at 303-876-3068.



FIGURE 1
DISTURBED TRASH



ATTACHMENT A
MANAGEMENT OF WASTE OUTSIDE SCOPE OF DISTURBED TRASH PROFILE

A. Containers

1. Identification

This type of debris can include tanks, totes, drums, and pails.

2. Segregation and Handling

Empty containers (less than 3 percent full) will be handled as municipal solid waste. Containers that are not empty (3 percent or more full) will be segregated and characterized in order to determine appropriate handling and disposal requirements. If the integrity of the non-empty container is in doubt, the container and its contents will be temporarily stored on a liner with secondary containment or placed in an overpack at the excavation prior to transport away from the site. The overpacks that are used will also be numbered and labeled. If the container is too large to overpack, the contents will be transferred to steel drums for characterization or handled by a waste oil recycler if appropriate. The containers will be examined for labels or other identifying information. Containers without complete identifying information will be characterized as potential hazardous waste. Containers with materials determined to be non-hazardous will be disposed of as municipal solid waste. Any liquid non-hazardous contents will be solidified prior to disposal by a third party off-site at a licensed facility.

B. Contaminated Soil

1. Identification

Soils that are visually stained, produce a sheen, or emit noticeable odors of petroleum or other organic chemicals will be treated as contaminated soil. Soil that is suspected to contain asbestos will be handled according to procedures described in Attachment B.

2. Segregation and Handling

Contaminated soil will be segregated and stockpiled on-site. It will then be evaluated to characterize the extent and type of contamination. Soils will be evaluated by using photoionization detector (PID) for volatile hydrocarbon screening followed up with a volatile organic compound (VOC) analysis (EPA Method 8260) if hydrocarbons are detected by the PID. Metal analysis for the 8 RCRA metals will be performed if the soil appears to have been stained by something other than hydrocarbons. Disposal will occur according to the type and concentration of contaminants detected in the soils.

C. Medical Waste

1. Identification

Medical waste consists of blood-soaked bandages, culture dishes and other glassware, surgical gloves, surgical equipment, needles, swabs, and occasionally discarded body parts. It is often contained in labeled orange plastic bags.

2. Segregation and Handling

Given the potential for harm from biohazards, any disturbed medical waste will be assumed to be infectious waste. It will be carefully excavated to minimize exposure to workers and dispersal into the environment and placed in a separate dedicated roll-off container or drums. The medical waste will then be transported to a municipal solid waste landfill permitted to accept such waste or a permitted medical waste treatment facility.

D. PCB Waste

1. Identification

Polychlorinated biphenyls (PCBs) are an oily liquid or solid, generally clear to yellow in color, with no smell or taste. PCBs are resistant to extreme temperature and pressure and were widely used prior to 1979 in electrical equipment such as capacitors, switches, and transformers. The identification of PCB-containing materials will be based on visual examination. Large closed electrical equipment will be assumed to be PCB-containing until tested.

2. Segregation and Handling

Large closed electrical equipment that is brought to the surface during excavation activities will be carefully placed in a separate dedicated roll-off container. Care will be taken to limit the potential for breaching the equipment shell or spillage of internal oil. The internal contents will be tested for PCBs. If the PCB concentration is 50 parts per million or higher, the equipment will be transported to a facility approved to accept PCB waste. If the PCB concentration is less than 50 parts per million, the equipment will be transported to a municipal solid waste landfill for disposal.

E. Hazardous Waste

1. Identification

All liquids and solids in non-empty containers will be considered potentially hazardous waste unless the container bears complete identifying information that indicates the material is not a hazardous waste.

2. Segregation and Handling

As discussed earlier, non-empty containers will be numbered, labeled, and moved to roll-off containers for temporary storage.

- If the contents are adequately described on exterior labeling and the contents are a listed hazardous waste (see 6 CCR 1007-3 Part 261 Subpart D), the container will be placed in a roll-off or set aside in drums on a pallet dedicated only to hazardous waste, labeled appropriately and segregated and staged according to its hazardous characteristic.
- If the contents are not adequately described on exterior labeling, the contents will be sampled in order to determine if they are hazardous by characteristics (the characteristics of ignitability, corrosivity, reactivity or toxicity). If the contents are hazardous by characteristics, the container will be moved to the dedicated hazardous waste roll-off.



- If the contents are not hazardous by listing or characteristics, the container will be moved to a roll-off destined for disposal at a municipal solid waste landfill. However, any liquid non-hazardous contents will be solidified prior to such disposal (solidification will be performed off-site by permitted operator with approved plan for solidifying the materials third parties).
- All materials determined to be hazardous based on listing or characteristics will be appropriately containerized, labeled, manifested, transported, and disposed of in accordance with the hazardous waste regulations.

F. Electronic Waste

Electronic waste will be segregated and delivered to a permitted electronic waste recycling facility.

G. Waste Tires

Waste tires will be segregated and delivered to a waste tire processing facility or waste tire collector.

H. Lead Acid Batteries

Lead acid batteries will be segregated and delivered to a permitted battery recycler.



ATTACHMENT B
SOIL CHARACTERIZATION AND MANAGEMENT PLAN (SMP)



PO Box 253 • Morrison, Colorado 80465 • Phone: (303) 932-8484

SOIL CHARACTERIZATION AND MANAGEMENT PLAN (ASBESTOS)
PIPELINE RIGHT OF WAY NEAR THE OLD ERIE LANDFILL
SOUTHWEST OF THE INTERSECTION OF
WELD COUNTY ROAD 5 AND WELD COUNTY ROAD 6
ERIE, COLORADO

Prepared for:

ENCANA SERVICES COMPANY, LTD.

Prepared by:

KOCH ENVIRONMENTAL HEALTH, INC.
PO BOX 253
MORRISON, COLORADO 80465

May 19, 2015

1.0 INTRODUCTION

This Soil Characterization and Management Plan (Plan) was prepared by Koch Environmental Health, Inc. (KEH) for Encana Services, Ltd. (Encana) in support of soil-disturbance activities to be conducted at the Pipeline Right-of-Way (ROW) near the Old Erie Landfill site in Erie, Colorado (Site). This pipeline ROW is located near the southwest corner of the intersection of Weld County Road 5 and Weld County Road 6 and located approximately 125 feet west of Weld County Road 5. Presently, Encana is unaware of the presence of surface or subsurface Asbestos Containing Materials (ACM) in this area, however, on December 5, 2014, thirteen (13) soil samples were collected and analyzed for asbestos content via Polarized Light Microscopy (PLM). One (1) of the samples analyzed was found to contain a trace amount of asbestos and one (1) sample contained floortile and associated mastic which contained 10% and 6% Chrysotile asbestos, therefore, this plan was developed to establish procedures that will take place should surface or subsurface ACM or suspect ACM be encountered during planned soil-disturbance activities.

2.0 BACKGROUND

The Old Erie Landfill began as an unpermitted landfill as early as the 1960's, but was brought to grade and closed under a special use permit issued by the Weld County Commissioner's in 1982. The closure plan was fully implemented in 1988 with the landfill capped with two-feet of clay and stormwater controls implemented. Post-closure care including semi-annual inspections were conducted for a ten-year period ending in 1998 when the site was released from post-closure obligations except groundwater monitoring. Groundwater monitoring of the site continues under the auspices of the Denver Regional South Groundwater Monitoring Program.

3.0 GENERAL SOIL DISTURBANCE ACTIVITIES

The Plan describes the procedures in support of Soil Disturbance Activities (SDA) to be conducted at the Site. Prior to any SDA, a Certified Asbestos Building Inspector (CABI) will visually inspect the area where SDA will occur, and when this area is designated to be free of visible known or suspected asbestos, SDA will be allowed to be performed by Encana personnel. During the performance of work of this nature, no asbestos-specific personal protective equipment of any type will be required to be utilized as long as the area remains designated as free of visible known or suspected asbestos as determined by the CABI observing the work.

4.0 SOIL DISTURBANCE ACTIVITIES WITH KNOWN OR SUSPECTED ACM

Encana personnel will not be involved in any SDA where known or suspected asbestos exists, and this work will be sub-contracted to a General Abatement Certificate (GAC) Holder. Personnel overseeing, directing, inspecting and/or handling soil (known or suspected of containing asbestos) shall have training appropriate to the work activity. Training must ensure compliance with the requirements of Section 5.5 of the Colorado Solid Waste Regulations. In addition, individuals with the potential for exposure to asbestos fibers shall be trained in the proper usage of personnel protective equipment and have a current annual physical with a medical release / respirator usage form.

All personnel working on the site shall be advised and directed to not disturb areas where suspect or known asbestos is present. Personnel driving onto the site shall be notified of suspect or known asbestos locations and directed to not drive on or otherwise disturb those areas.

4.1 NON-FRIABLE ACM

In the event that known or suspect non-friable ACM is encountered within the work area, individuals trained and certified as asbestos workers in accordance with CDPHE will be utilized in the performance of sorting and hand-picking the materials from within this area. All workers will be under the direct supervision of a certified asbestos supervisor. OSHA compliance air monitoring per the requirements of OSHA 1926.1101 will be performed on the certified asbestos workers for the duration of removal of non-friable asbestos, should it occur. Exposure monitoring will be conducted by the GAC. KEH will review all exposure monitoring results.

When any known or suspected suspect ACM are encountered during SDA, this work will cease in the immediate area until the identified suspect remnants are removed via the following:

- CDPHE-certified Asbestos Workers will remove all known or visible suspect materials encountered via hand-picking and wet-methods.
- The known or suspect materials will be placed in appropriately labeled 6 mil polyethylene bags for disposal as asbestos waste.
- A CDPHE-Certified Asbestos Building Inspector (CABI) will inspect the area to ensure that suspect materials have been removed.
- Work will continue in the manner described above.

4.2 SUSPECT FRIABLE ACM

When any known or suspect friable ACM are encountered during excavation, this work will cease in the immediate area until the identified suspect remnants are removed via the following:

Work will be conducted by a licensed GAC in accordance with the provisions of State of Colorado Regulation No. 8 Part B, The Control of Asbestos (hereafter referred to as CDPHE Regulation 8) and OSHA 1926.1101 (Asbestos Standard for Construction).

Should subsurface friable ACM be encountered during excavation operations, the selected Asbestos Abatement Contractor will conduct removal of the ACM as follows:

The CDPHE will be notified within 24 hours of any unexpected asbestos containing soil (ACS) and/or ACM discovery. Contractor will immediately notify CDPHE. The CDPHE can be notified by fax to 303-759-5355, or emailed to comments.hmwmd@state.co.us.

1. Personnel performing removal of friable asbestos and the associated 2" soil and/or debris will wear disposable outer protective clothing, booties and rubber gloves, which will be discarded as asbestos waste prior to exiting the work area.
2. Erection of wind fences as close as possible to the perimeter of the gridded area.
3. Heavy equipment (e.g. excavators, backhoes, front end loaders, etc.) equipped with water misting bars to keep known or suspected ACM wet at all times.
4. Air monitoring on operators and ground personnel and on perimeter wind fences via TEM (presence/absence) to determine if airborne asbestos contamination is being generated. Air samples will be shipped daily to an accredited laboratory with analysis to be performed according to a 24-hour turnaround time.

5. Stop work if wind speeds exceed 12 mph or sustained gusts over 20 mph.
6. Removal and direct loading of known or suspected ACM, along with at least 2 inches of surrounding soil into commercially-available, reinforced (rip stop) 40 ft. disposal bags (i.e. "burrito bags") with no puncturing of disposal bags.
7. All tools and equipment used during the project will be properly stored and cleaned before the project is completed. Once the project is complete, small tools and equipment will be cleaned and double bagged in 6 mil poly bags before being loaded into a poly lined equipment truck. Any large pieces of equipment, including excavators and loaders, will be thoroughly decontaminated on a designated, poly-lined decontamination pad after use. The waste water will be collected in a rubber-lined basin and filtered down to five microns. In addition, all large equipment will be wiped down to be free of dust or debris. The onsite AMS/ABI will inspect all large equipment prior to removing them from the site to verify that they are free of suspect visible debris.
8. Poly-lined straw waddles will be utilized to catch any excess water runoff from the work areas. The straw waddles will be a minimum height of one foot high, but can be higher in areas that have an increased chance of runoff (high slope angles, etc.). The straw waddles will be thoroughly inspected at the start and end of every work day. After the project, the straw waddles will be disposed of as asbestos waste.
9. Increased barricades will be implemented to ensure that no debris can spill over into any adjacent properties or public areas, although that occurrence is not anticipated.

5.0 TRANSPORTATION

Waste trucks will be onsite to accommodate the removal of all ACM materials using CDPHE standard procedures for truck lining for the purposes of hauling asbestos waste. Waste trucks will be provided by the GAC. All trucks will first be poly-lined with one 4-mil polyethylene slip layer; a layer of 10-mil poly; and two layers of 6-mil poly. The truck will then be filled with waste/debris by the track-loader. Once filled, it will be properly sealed. The two 6-mil poly layers and the 10-mil layer will individually be overlapped over the top of the debris and sealed with tape and glue. The outside layer (10-mil) will be mechanically fastened with zip-ties.

A poly-lined staging area shall be setup in the work area to accommodate the loading of the waste trucks. Truck drivers will remain inside the cab with the windows closed during loading operations. A generator label will be attached to each properly sealed truck load prior to leaving site. All waste loading and sealing activities will be inspected by the onsite AMS/CABI before being removed from the site.

Unloading at the landfill will be done according to the proper and best procedures according to the requirements of the designated asbestos waste landfill. Precautions will be taken to ensure that a breach or spill of the burrito bag contents does not occur while unloading the asbestos containing waste material. This will involve unloading the waste in a slow and non-destructive manner. In addition, the use of heavy equipment to move or compress the waste should be limited.

Each driver will call the onsite CABI or GAC Supervisor to let them know that the load was unloaded successfully.

Should an asbestos spill occur offsite while being transported to the landfill, spill actions will be implemented. These actions will include stopping work, restricting the area, placing asbestos spill signs in the area, placing the area under negative pressure (if applicable), HEPA vacuuming and wet-wiping the area, properly disposing of the waste and final air sampling. In any case, minor or major, if a spill occurs all work will stop and the CDPHE will be notified.

In the unlikely event of a breach of a burrito bag, or if any ACM is found on the exterior of the trucks while being transported to a landfill, all transportation and work actions will stop and proper spill response actions will take place, depending on the size and extent of the spill. CDPHE will be contacted if such an issue should arise in order to better coordinate and implement proper spill response procedures.

5.0 AVAILABILITY OF THE SOIL CHARACTERIZATION AND MANAGEMENT PLAN

This Plan will be distributed to all supervisory personnel at the Site, and will also be maintained on Site at the administrative office and will be available for review upon request.

Prepared by,

A handwritten signature in black ink, appearing to read "T.D. Koch".

Thomas D. Koch, CIH



STEWART ENVIRONMENTAL
CONSULTING GROUP, LLC
ENGINEERING FOR LIFE



Report on Phase 2 Nature and Extent Investigation at the Stratus Redtail Ranch, LLC Erie, Colorado

Prepared for:

Stratus Redtail Ranch, LLC
Greenwood Village, Colorado

Prepared by:

Stewart Environmental Consulting Group, LLC
Consulting Engineers and Scientists
Fort Collins, Colorado

October 20, 2017

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APPENDICES

- Appendix A: Water Quality Lab Reports
- Appendix B: Geotechnical Logs and Report
- Appendix C: Groundwater Sampling Logs
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- Appendix F: Land Surveyor Certification
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1.0 INTRODUCTION

1.1 General Information

The Stratus Redtail Ranch, LLC ("**Stratus**") property is located in Weld County, Colorado. It has been determined that a portion of this property was the subject of landfilling activities dating back to mid 1960's through spring or early summer of 1969. The Certificate of Designation issued by Weld County that specifically included the Stratus property was revoked on April 23, 1969.

Pursuant to a Colorado Department of Public Health and Environment ("**CDPHE**") approved work plan for the Phase 2 investigation of soil and ground water dated June 13, 2017. Stratus conducted the Phase 2 nature and extent investigation from July 6 to July 27, 2017. The property on which the investigation was conducted is generally shown in Figure 1-1 (the "**Work Area**"). Figure 1-1 also outlines the property owned by Stratus.

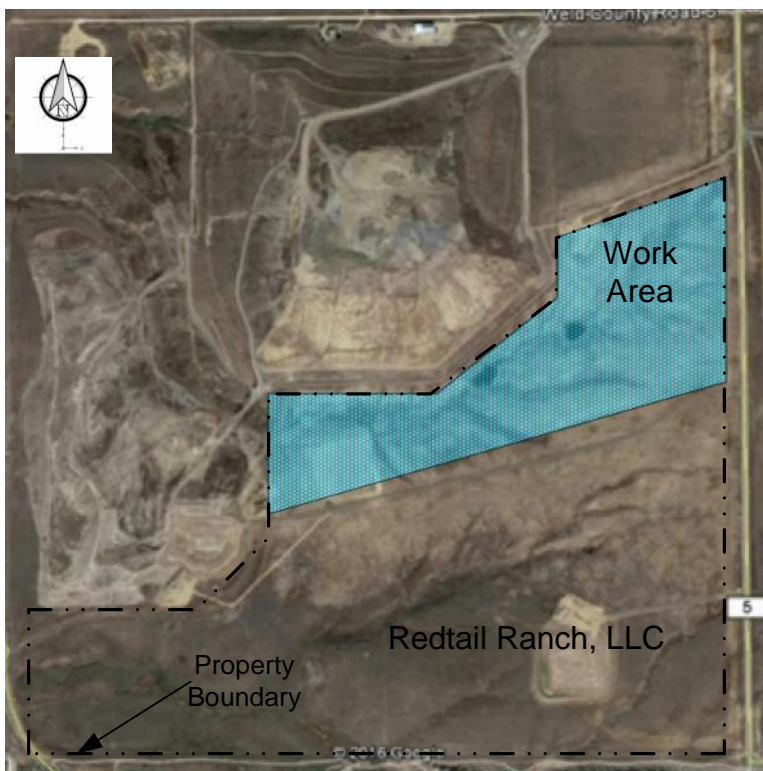


Figure 1-1 – Site Location

The purpose of this document is to provide the results of the Phase 2 nature and extent investigation approved by CDPHE.

1.2 Site History

A complete site history was included in the approved Revised Nature and Extent Investigation submitted on May 10, 2017.

1.3 Objectives of CDPHE Approved Investigative Work Plan

The primary objectives of this investigation were:

1. To further define and clarify the shallow groundwater elevations and the extent of shallow groundwater contamination in the Work Area.
2. To further define the shallow groundwater flow direction.
3. To further define the location of any organic compounds in the shallow groundwater through the installation of new or replacement groundwater wells.
4. To identify the potential existence of and identify and add to the project data base the surveyed location of buried drums at the site.
5. To survey and add to the project data base the surveyed location of (i) new or replacement shallow groundwater well locations and (ii) location of all test pit locations.
6. To generate a bedrock map for the site.
7. To develop a three dimensional map of the contamination at the site in relationship to the shallow groundwater and the contamination at the site.

1.4 Report Organization

The report is divided into the following sections

1. Section 2.0 – Groundwater Results
2. Section 3.0 – Buried Drum Investigation
3. Section 4.0 – Identification and Location of Solid Waste
4. Section 5.0 – Bedrock Mapping
5. Section 6.0 – Bioremediation Testing
6. Section 7.0 – Phase Two Investigation Recommendations

In each section, if there was a deviation from the approved plan, it is discussed in that particular section.

2.0 GROUNDWATER RESULTS

2.1 Site Location and Description

The Work Area is reflected in Figure 1-1 and consists of the following basic topographic features:

-) The previous landfilling area appears to be in the “valley fill” areas of the Work Area. This is in a general northeast – southwest direction.
-) The shallow groundwater flow appears to be to the west down the paleo channel based on the survey information and groundwater well information described herein. While the flow is towards the west, there potentially are two shallow groundwater basins. The two areas are separated by currently dry areas between the basins and the groundwater within the two the shallow groundwater have significantly different specific conductivities.
-) Surface water flows west down the valley of the Work Area. Before the landfilling activity at the site, the valley contained a shallow, fairly straight, streambed with a perennial stream. In the 1980’s, small dams were added to enhance bird hunting activities at the site.
-) A report prepared by Doty and Associates in September 1994 for the Denver Regional Landfill South¹ identified deeper groundwater in the area of the No. 6 Coal seam, which is the upper most coal seam with groundwater. This Coal Seam was found at approximately 280 feet below the surface. However, Doty installed several wells near the work area S-208, S209 and S-210, which have well screened bottom elevation of 5,062 to 5,069 feet and produce water. The depth below the surface is approximately 150 feet. In using these wells as a guide, the depth of water near the southern portion of the Work area would be approximately 185 feet. The deepest wells in the Work Area are MW-17 and MW-18, which have a bottom elevation of 5130 to 5153. This represents a required additional depth of 67 to 93 feet to the Coal Seam number 6 without taking into effect the dip of this coal seam. 2.2 Installation and Abandonment of Groundwater Wells

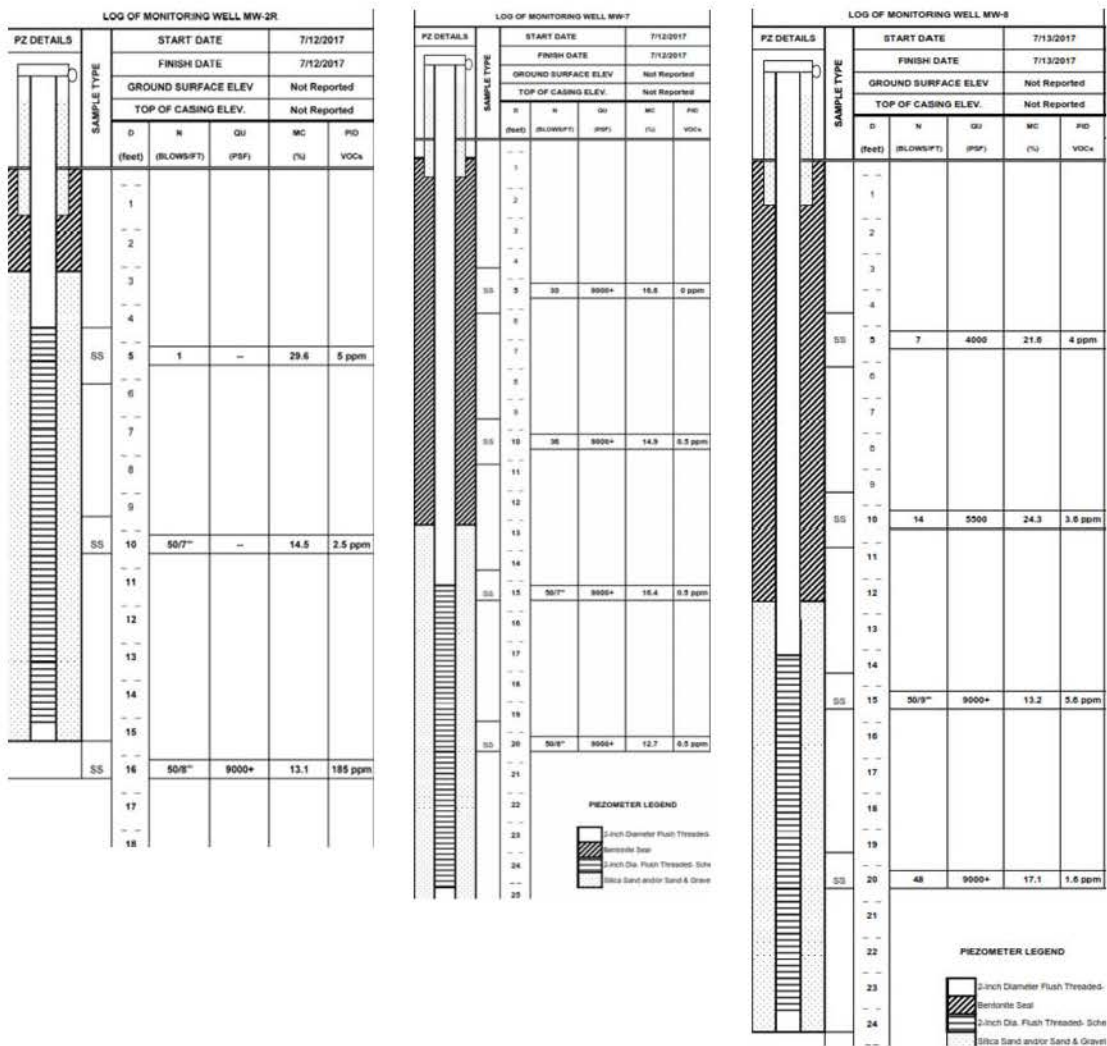
Pursuant to the approved Phase 2 Nature and Extent Investigation, the following wells were either closed, in accordance with Colorado State Engineer regulations or installed in the locations identified in Figure 2-1:


Table 2-1				
Redtail Ranch, LLC				
Stratus Companies				
Groundwater Well Abandonment and Installation/Replacement				
Item	Report Well Number	Disposition	New Well Number	Notes
1	QMW-1	Abandon	NA	Wells abandoned in July 2017
2	QMW-2	Abandon	NA	
3	QMW-4	Abandon	NA	
4	QMW-6	Abandon	NA	
5	QMW-7	Abandon	NA	
6	QMW-10	Abandon	NA	
7	QMW-12	Abandon	NA	
8	QMW-15	Abandon	NA	
9	QMW-3	Relocate in current location	MW-14	Wells relocated in July 2017
10	QMW-5	Relocate in new location	MW-19	
11	QMW-8	Relocate in new location	MW-13	
12	QMW-9	Relocate in current location	MW-12	
13	QMW-11	Relocate in current location	MW-20	
14	QMW-13	Relocate in new location	MW-11	
15	QMW-14	Relocate in current location	MW-18	
16	QMW-16	Relocate in current location	MW-16	
17	QMW-17	Relocate in current location	MW-17	
18	Q TB 1	Relocate in current location	MW-15	Wells remained on site - Note: MW-2 had to be replaced (now MW-2R) near the original MW 2 due to well failure
19	SEC MW-1	Keep in current location and condition	MW-1	
20	SEC MW-2	Keep in current location and condition	MW-2R	
21	SEC MW-3	Keep in current location and condition	MW-3	
22	SEC MW-4	Keep in current location and condition	MW-4	
23	SEC MW-5	Keep in current location and condition	MW-5	
24	SEC MW-6	Keep in current location and condition	MW-6	Wells installed in July 2017
25	MW-7	New monitoring well	MW-7	
26	MW-8	New monitoring well	MW-8	Wells not installed due to site access restriction
27	MW-9	New monitoring well	MW-9	
28	MW-10	New monitoring well	MW-10	

As noted in Table 2-1, MW-2 was replaced (MW-2R) due to the well construction failure. When the sampling was performed in July, it was discovered that the well screening had failed and the well was full of the sand packing from the exterior of the well.

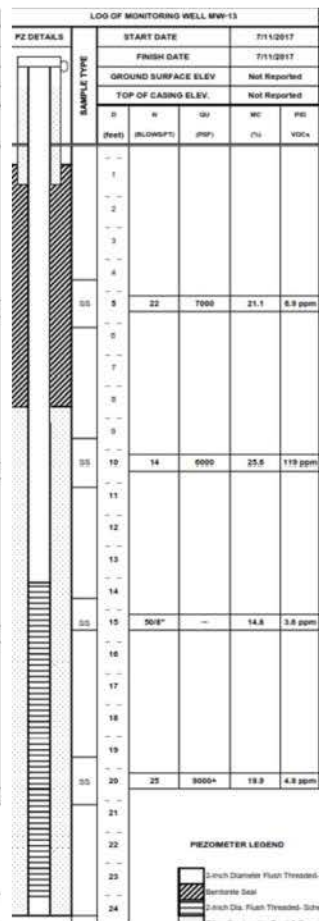
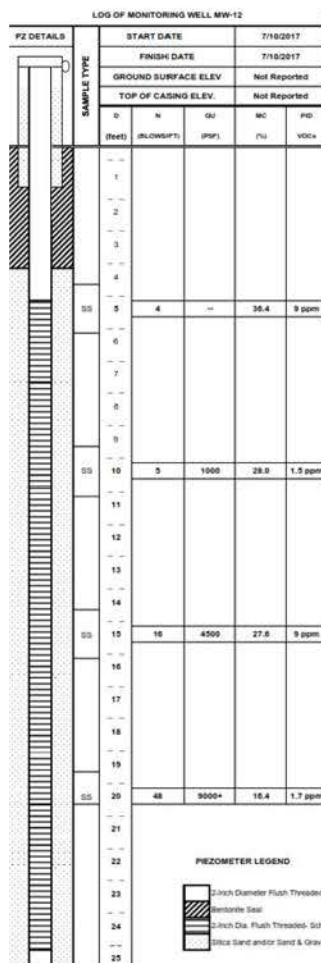
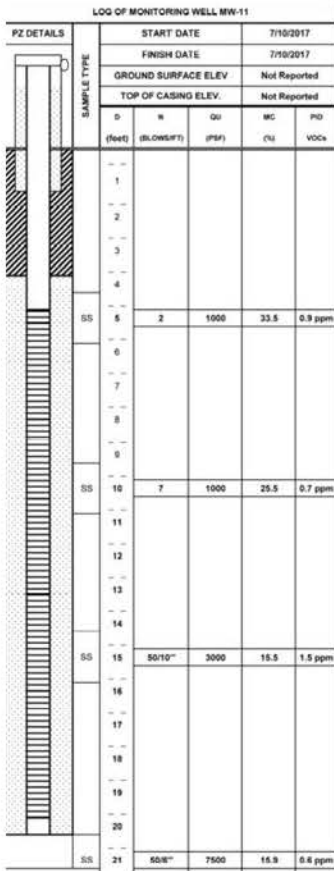
The remaining wells were located as described above are identified on Figure 2-1 and such locations were approved by CDPHE. This figure also provides the groundwater isopleths for the July 2017 sampling. Based on the July 2017 sampling event, there is currently a dry area between the eastern side of the site and the western side of the site.


The summary of the well installation for the July 2017 work is presented in Figures 2-2 A through 2-2 H. A full report in Appendix B presents the well installation details, including drill logs. The wells were installed in accordance with Table 2-1 and Figure 2-1. No deviations from the approved work plan occurred other than the slight location modifications of well locations due to site access issues all of which were approved by CDPHE and the previously noted replacement of MW-2 with MW-2R.



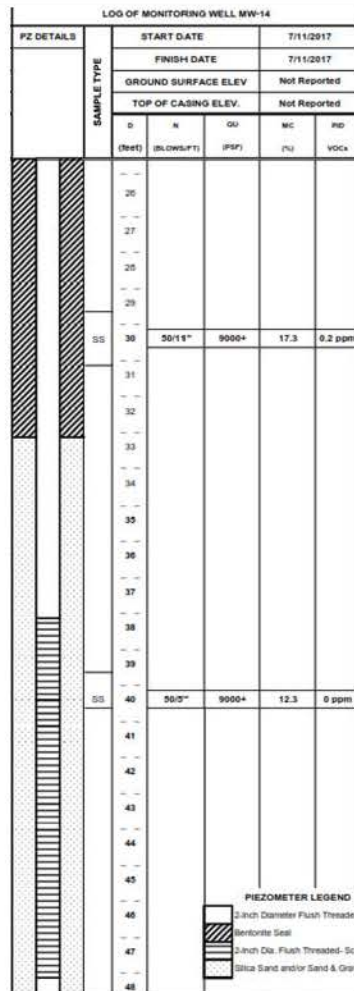
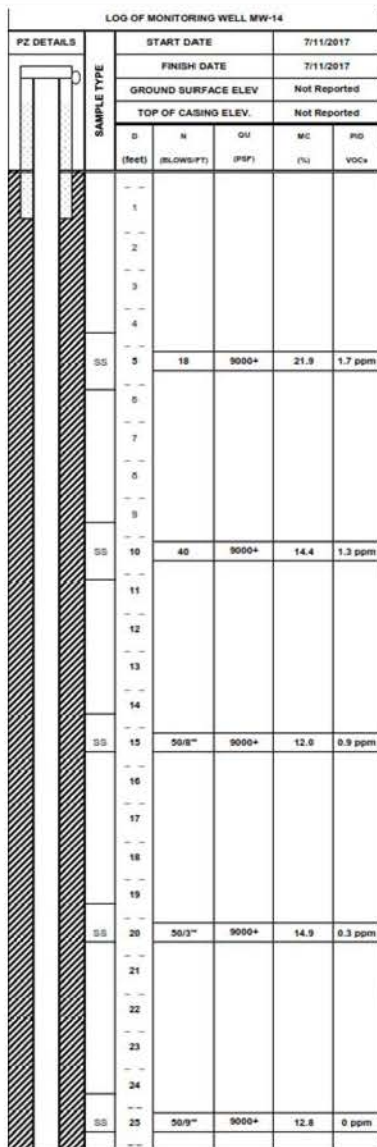
 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE		PROPERTY LOCATION Stratus Redtail Ranch, LLC Phase 2 Investigation	FIGURE 2—2A
PROJECT NUMBER 4838-001	DATE July 2017		

wp files\4263.001\figure 1 - site location.cdr



 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE	PROPERTY LOCATION	Stratus Redtail Ranch, LLC Phase 2 Investigation	FIGURE 2—2B
	PROJECT NUMBER 4838-001		

wp files\4263.001\figure 1 - site location.cdr



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DATE

July 2017

PROPERTY LOCATION


Stratus Redtail Ranch, LLC
Phase 2 Investigation

FIGURE 2—2C


wp files\4263.001\figure 1 - site location.cdr

STRATUS REDTAIL RANCH PHASE TWO REPORT
STEWART ENVIRONMENTAL CONSULTING GROUP, LLC



 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE	PROPERTY LOCATION		Stratus Redtail Ranch, LLC Phase 2 Investigation	FIGURE 2—2D
	PROJECT NUMBER	DATE		
4838-001	July 2017			

wp files\4263.001\figure 1 - site location.cdr

LOG OF MONITORING WELL MW-17						
PZ DETAILS		START DATE			7/5/2017	
		FINISH DATE			7/5/2017	
		GROUND SURFACE ELEV.			Not Reported	
		TOP OF CASING ELEV.			Not Reported	
		Q	N	GU	MC	MS
(Feet)	(Blows/ft)	(PSF)	(%)	VOCs		
1						
2						
3						
4						
SS 5	35	9000+	9.8	0 ppm		
6						
7						
8						
9						
SS 10	50	9000+	12.7	0 ppm		
11						
12						
13						
14						
SS 15	50	9000+	12.2	0 ppm		
16						
17						
18						
19						
SS 20	50/8"	9000+	11.4	0 ppm		
21						
22						
23						
24						
SS 25	50/9"	9000+	10.3	0ppm		

LOG OF MONITORING WELL MW-17						
PZ DETAILS		START DATE			7/5/2017	
		FINISH DATE			7/5/2017	
		GROUND SURFACE ELEV.			Not Reported	
		TOP OF CASING ELEV.			Not Reported	
SAMPLE TYPE		Q	N	GU	MC	PD
		(Feet)	(Blows/ft)	(PSF)	(%)	VOCs
		--	--			
		25				
		--	--			
		27				
		--	--			
		28				
		--	--			
		29				
		--	--			
	SS	30	42	9000+	11.5	0 ppm
		--	--			
		31				
		--	--			
		32				
		--	--			
		33				
		--	--			
		34				
		--	--			
	SS	35	50	9000+	18.6	0 ppm
		--	--			
		36				
		--	--			
		37				
		--	--			
		38				
		--	--			
		39				
		--	--			
	SS	40	50	9000+	17.6	0 ppm
		--	--			
		41				
		--	--			
		42				
		--	--			
		43				
		--	--			
		44				
	SS	45	50.8"	--	13.6	0 ppm
		--	--			
		46				
		--	--			
		47				
		--	--			
		48				
		--	--			
		49				
	SS	50	50.9"	9000+	19.0	0 ppm

LOG OF MONITORING WELL MW-17						
PZ DETAILS		START DATE			7/5/2017	
		FINISH DATE			7/5/2017	
		GROUND SURFACE ELEV.			Not Reported	
		TOP OF CASING ELEV.			Not Reported	
SAMPLE TYPE		Q	N	GU	MC	MD
		(feet)	(BLOWS/FT)	(PSF)	(%)	VOCs
	51					
	52					
	53					
	54					
	SS 55	52	9000+	20.6	0 ppm	
	56					
	57					
	58					
	59					
SS	60	50.6"	9000+	13.6	0 ppm	
	61					
	62					
	63					
	64					
SS	65	50.9"	9000+	12.0	0 ppm	
	66					
	67					
	68					
	69					
SS	70	50.9"	9000+	10.4	0 ppm	



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PROPERTY LOCATION

Stratus Redtail Ranch, LLC
Phase 2 Investigation

FIGURE 2—2E

wp files\4263.001\figure 1 - site location.cdr

STRATUS REDTAIL RANCH PHASE TWO REPORT
STEWART ENVIRONMENTAL CONSULTING GROUP, LLC

LOG OF MONITORING WELL MW-18					
PZ DETAILS		START DATE			
		7/6/2017			
		FINISH DATE			
		7/10/2017			
		GROUND SURFACE ELEV.			
		Not Reported			
		TOP OF CASING ELEV.			
		Not Reported			
SAMPLE TYPE	D (feet)	N (BLOWS/FT)	QU (PSF)	MC (%)	PD VOCs
	1				
	2				
	3				
	4				
SS	5	15	9000+	17.1	0 ppm
	6				
	7				
	8				
	9				
SS	10	32	9000+	13.0	0 ppm
	11				
	12				
	13				
	14				
SS	15	36	9000+	20.7	0 ppm
	16				
	17				
	18				
	19				
SS	20	32	9000+	21.0	0 ppm
	21				
	22				
	23				
	24				
SS	25	30	9000+	22.3	0 ppm

LOG OF MONITORING WELL MW-18					
PZ DETAILS		START DATE			
		7/6/2017			
		FINISH DATE			
		7/10/2017			
		GROUND SURFACE ELEV.			
		Not Reported			
		TOP OF CASING ELEV.			
		Not Reported			
SAMPLE TYPE	D (feet)	N (BLOWS/FT)	QU (PSF)	MC (%)	PD VOCs
	26				
	27				
	28				
	29				
SS	30	50/5"	9000+	9.8	0 ppm
	31				
	32				
	33				
	34				
	35				
	36				
	37				
	38				
SS	39	50/5"	--	8.4	0 ppm
	40				
	41				
	42				
	43				
	44				
	45				
	46				
	47				
	48				
	49				
SS	50	50/5"	--	10.6	0 ppm

LOG OF MONITORING WELL MW-18					
PZ DETAILS		START DATE			
		7/6/2017			
		FINISH DATE			
		7/10/2017			
		GROUND SURFACE ELEV.			
		Not Reported			
		TOP OF CASING ELEV.			
		Not Reported			
SAMPLE TYPE	D (feet)	N (BLOWS/FT)	QU (PSF)	MC (%)	PD VOCs
	51				
	52				
	53				
	54				
	55				
	56				
	57				
	58				
SS	59	50/5"	--	9.7	0.8 ppm
	60				
	61				
	62				
	63				
	64				
	65				
	66				
	67				
	68				
	69				
	70				
SS	71	50/5"	9000+	11.2	1.9 ppm



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DATE

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PROPERTY LOCATION

Stratus Redtail Ranch, LLC
Phase 2 Investigation

FIGURE 2—2F

wp files\4263.001\figure 1 - site location.cdr

STRATUS REDTAIL RANCH PHASE TWO REPORT
STEWART ENVIRONMENTAL CONSULTING GROUP, LLC

LOG OF MONITORING WELL MW-18					
PZ DETAILS		START DATE		7/6/2017	
SAMPLE TYPE		FINISH DATE		7/10/2017	
		GROUND SURFACE ELEV.		Not Reported	
		TOP OF CASING ELEV.		Not Reported	
D	N	OU	MC	PD	
(feet)	(BLOWS/FT)	(PSF)	(%)	VOCs	
1					
2					
3					
4					
5	15	9000+	17.1	0 ppm	
6					
7					
8					
9					
10	32	9000+	13.0	0 ppm	
11					
12					
13					
14					
15	36	9000+	20.7	0 ppm	
16					
17					
18					
19					
20	32	9000+	21.0	0 ppm	
21					
22					
23					
24					
25	30	9000+	22.3	0 ppm	

LOG OF MONITORING WELL MW-18					
PZ DETAILS		START DATE		7/6/2017	
SAMPLE TYPE		FINISH DATE		7/10/2017	
		GROUND SURFACE ELEV.		Not Reported	
		TOP OF CASING ELEV.		Not Reported	
D	N	OU	MC	PD	
(feet)	(BLOWS/FT)	(PSF)	(%)	VOCs	
26					
27					
28					
29					
30	50/5"	9000+	9.8	0 ppm	
31					
32					
33					
34					
35					
36					
37					
38					
39	50/5"	--	8.4	0 ppm	
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50	50/3"	--	10.6	0 ppm	

LOG OF MONITORING WELL MW-18					
PZ DETAILS		START DATE		7/6/2017	
SAMPLE TYPE		FINISH DATE		7/10/2017	
		GROUND SURFACE ELEV.		Not Reported	
		TOP OF CASING ELEV.		Not Reported	
D	N	OU	MC	PD	
(feet)	(BLOWS/FT)	(PSF)	(%)	VOCs	
51					
52					
53					
54					
55					
56					
57					
58					
59					
60	50/5"	--	9.7	0 ppm	
61					
62					
63					
64					
65					
66					
67					
68					
69					
70					
71	50/5"	9000+	11.2	1.9 ppm	



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July 2017

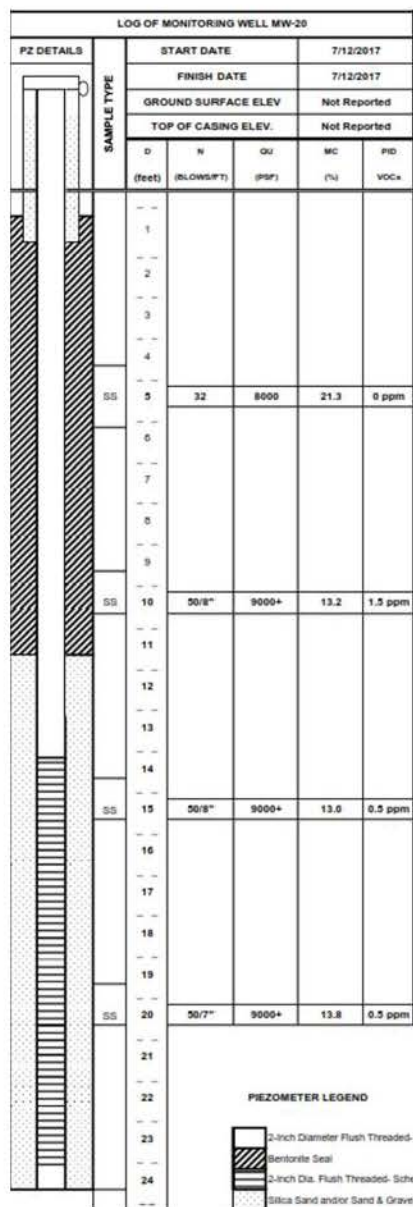
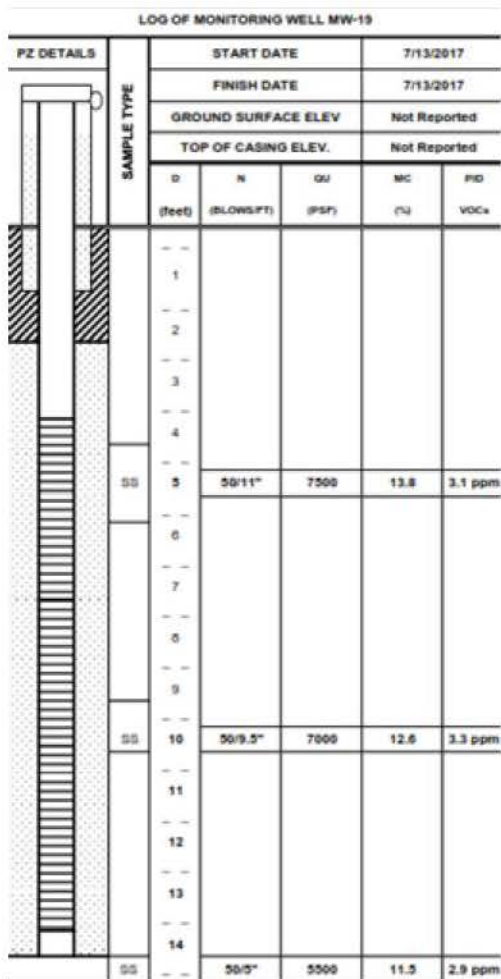
PROPERTY LOCATION

Stratus Redtail Ranch, LLC
Phase 2 Investigation

FIGURE 2—2G

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STRATUS REDTAIL RANCH PHASE TWO REPORT
STEWART ENVIRONMENTAL CONSULTING GROUP, LLC



 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE		PROPERTY LOCATION Stratus Redtail Ranch, LLC Phase 2 Investigation	FIGURE 2—2H
PROJECT NUMBER 4838-001	DATE July 2017		

wp files\4263.001\figure 1 - site location.cdr

2.3 Development of Isopleths for Groundwater Flow

As part of the approved Phase 2 scope of work groundwater flow direction and isopleths were to be better defined. This is found on Figure 2-1. At the time of sampling performed in July 2017, the shallow groundwater had two distinct areas, one on the east and one on the west side of the Work Area. These are further defined by the cross sections found in Figure 2-3, which provides the north-south cross section on the site near MW-3B. As noted in this cross section, the groundwater elevation in MW-3B is 5193.96. The bedrock surface in MW-3B is 5201.00. As noted in the drill logs for MW-3B, the bottom of the well was placed in the weathered bedrock to assist in obtaining a groundwater sample. The bedrock elevation as indicated in the AG Wassenarr 2016 report² in TB 3 and TB 4 (located approximately 375 feet to the southwest and 350 to the southeast respectively of MW-3B) are 5208 and 5227 respectively above MSL. This is over 15 feet above the groundwater table. Therefore, the potential to move shallow groundwater to the south is non-existent.

The isopleths were developed utilizing Surfer V14. This program is developed by Golden Software and is industry standards for the presentation of various isopleths, such as groundwater flow, contaminate concentrations and bedrock surfaces.

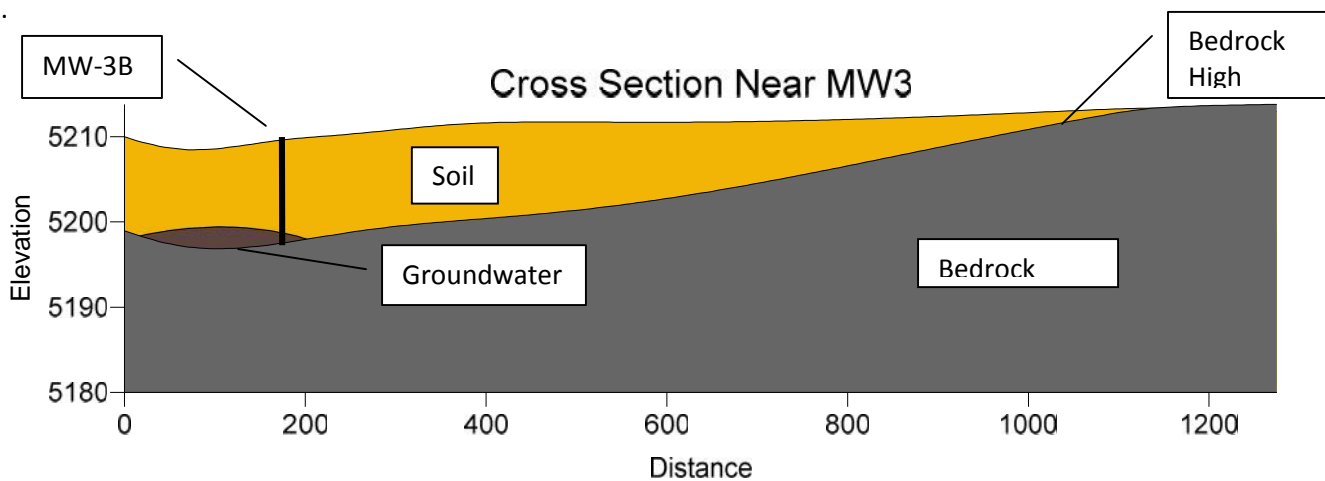


Figure 2-3 – North South Cross Section

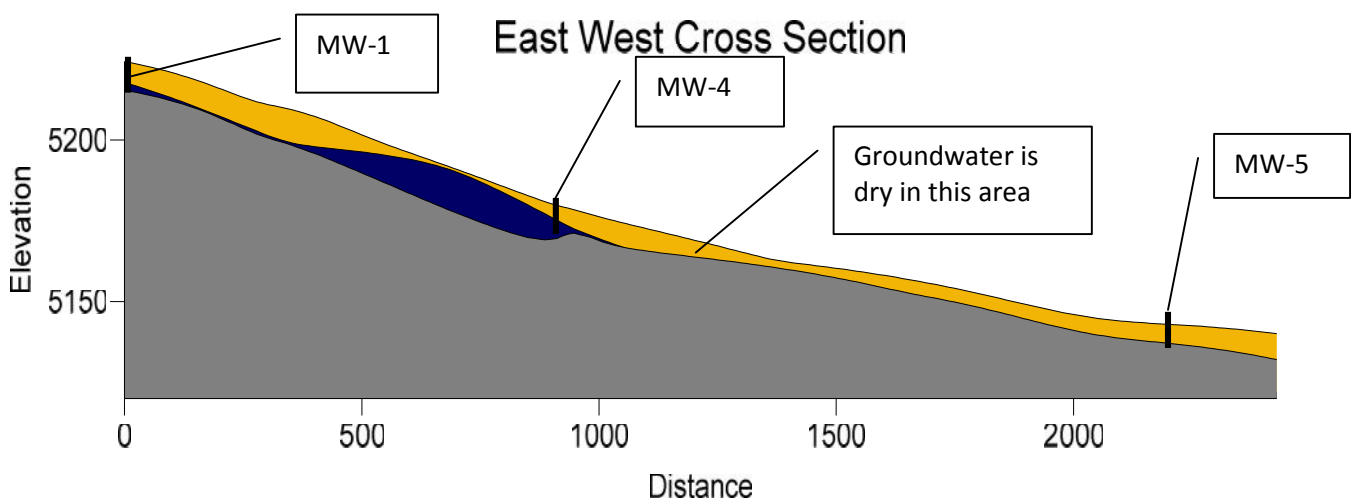


Figure 2-4 – East West Cross section from MW1 to MW5

Figure 2-4 provides the East-West Cross Section from MW-1 to MW-5. As shown in this Surfer 14 plot, there is a dry area between the east and west portions of the site. This is consistent with the observations in the field. As stated previously, this is based on one sampling event and the shallow groundwater could move to the west if the hydraulic head is higher in elevation.

2.4 Replacement of Quest Wells for Deeper Groundwater Investigation

In the Quest investigation, two wells (QMW-14 and QMW-17) were placed at an approximate depth of 70 feet. These Quest wells did indicate groundwater was at these levels. In July 2017, these wells were reinstalled to approximately the same depth (MW-17 and MW-18. These wells have not produced water as late as August 2017.

2.5 Groundwater Sampling and Water Quality Results

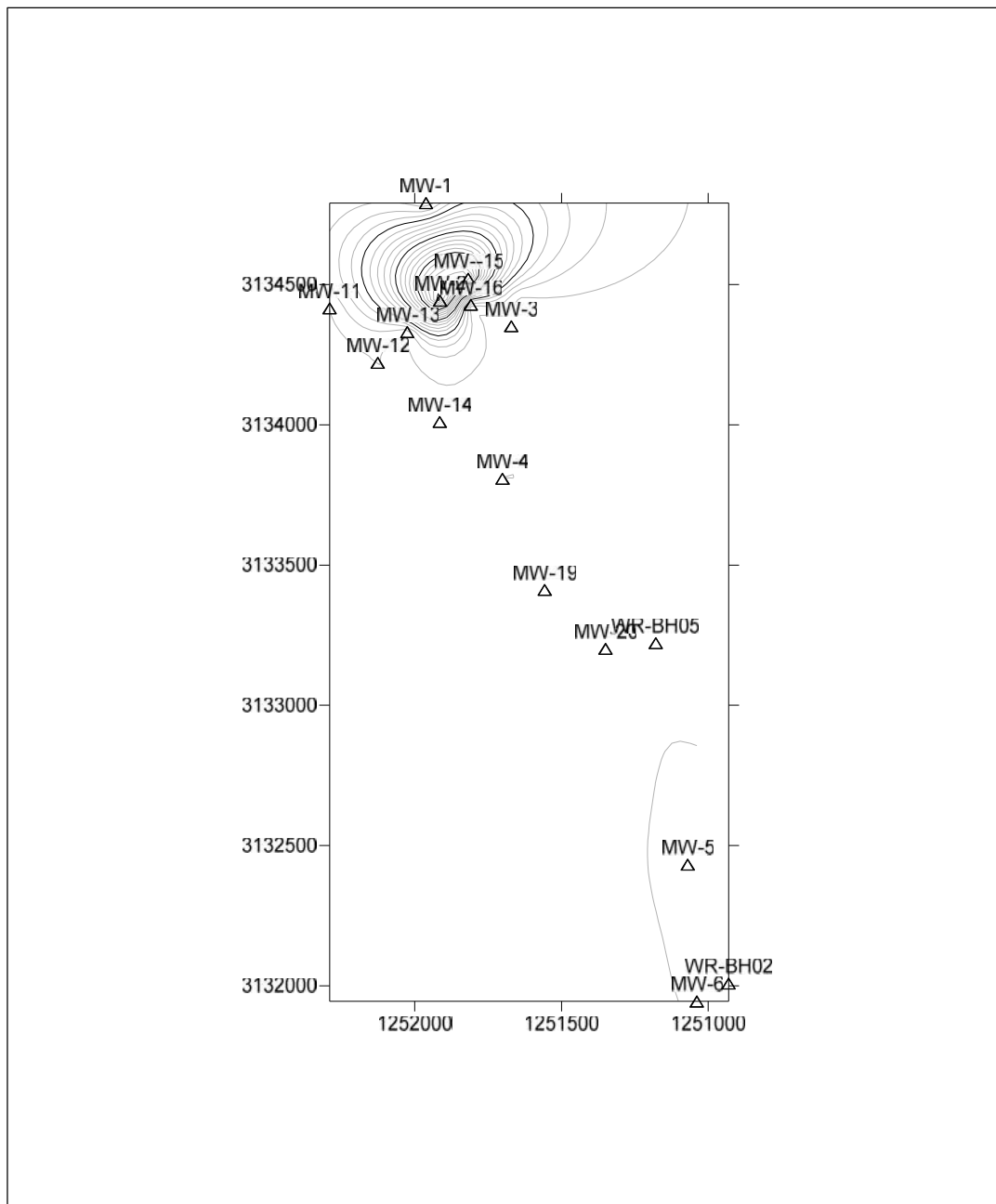
The groundwater sampling logs are found in Appendix C. During the sampling events, due to shipping issues to the laboratory, the samples were delayed in shipping, thereby exceeding holding times. As a result, several of these wells needed to be re-sampled. The Chain of Custody for each event is provided in Appendix D with each laboratory report. The original and revised sampling dates are noted in Table 2-2. During the sampling event, if the wells were evacuated within a short time prior to the subsequent sampling, then the wells were not redeveloped but re-sampled.


The water quality results from all wells are very similar to previous results with the exception of nitrate on the western side of the site. These groundwater constituent values are found in Table 2-2.

The groundwater isopleths for the various contaminants are provided in Figures 2-5A to 2-5F. The larger format figures are found in Appendix G. The red isopleths on these larger format figures indicate values above the groundwater standard. These figures show the concentration of contaminants in the eastern portion of the Work Area. As noted previously, the value of nitrates decreased in the wells on the western side from very high levels above 100 mg/l to less than 10 mg/l in all of the wells except for the QMW-12, which had a value 33.9 mg/l. The QMW-12 well is being replaced by Waste Connections and should be reviewed after that time. For the wells on the Work Area, the nitrate values are below the groundwater standard.

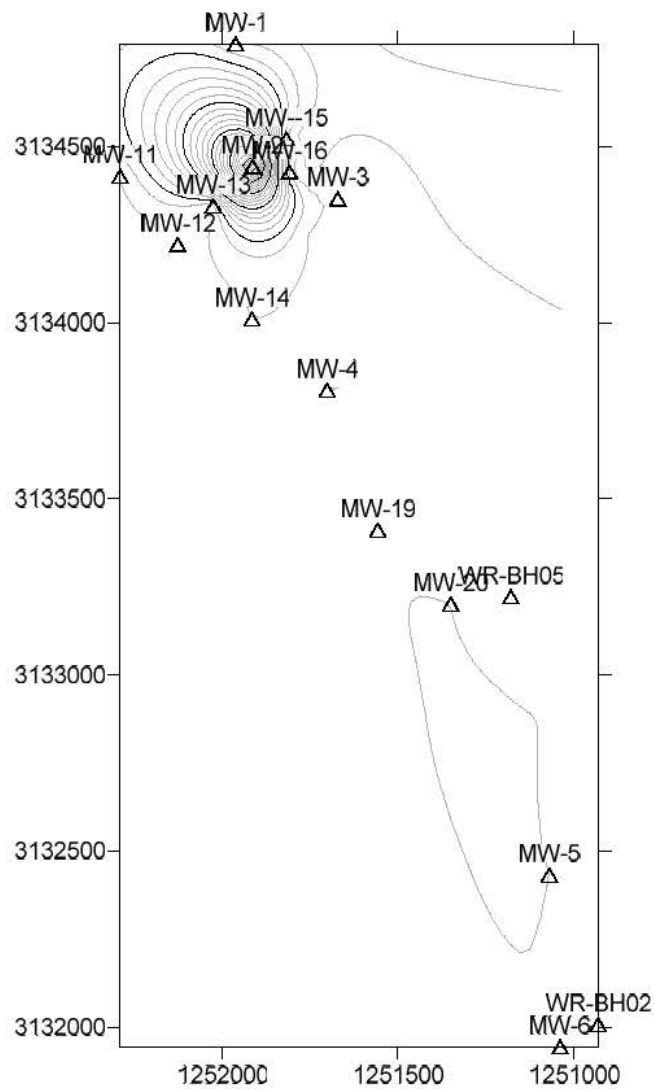
The VOC's on the west side continue to be below or near detection limits. The VOC's at or above groundwater standards are limited to the east side of the site.


Parameter	Compound CAS Number	CDPHE Water Quality Groundwater Standards	MW-1		MW-2	MW-2R	MW-3B		MW-4		MW-5		MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	QMW-12							
			12/16/2016	7/10/2017	12/16/2017	7/17/2017	12/16/2017	7/10/2017	12/16/2017	7/17/2017	12/16/2017	7/12/2017	12/16/2017	7/6/2017					7/11/2017	7/11/2017	7/12/2017		7/10/2017	7/6/2017			7/27/2017	7/13/2017	8/23/2017						
				7/20/2017		7/20/2017		7/20/2017		7/20/2017		7/27/2017		7/20/2017		7/10/2017				7/19/2017	7/19/2017	7/20/2017		7/17/2017	7/17/2017			7/20/2017							
VOC's (Method 8260) ug/l																																			
Acetone	67-64-1	6300	<2	32	<2000	<380	<20	28	Dry Well - No Sample	9.1 - J	<2	<1.9	<2	4.1 - J	Dry - No Sample	Dry - No Sample	Not Installed - on Waste Connections Property	Not Installed - on Waste Connections Property	25.00	23.00	110 - J	Dry - No Sample	42.00	<190	Dry - No Sample	Dry - No Sample	<1.9	28.00	<1.9						
Benzene	71-43-2	5	<2	<0.16	<2000	<32	<20	<0.16		<0.16	<2	<0.16	<2	0.37 - J					0.24 - J	1.8 - J	<6.4		<0.16	<16			<0.16	<0.16	<0.16						
1,1, DCE	75-35-4	7	<2	<0.13	<2000	<46	<20	<0.23		<0.23	<2	<0.2	<2	<0.23					<0.22	0.51 - J	240		<0.23	35 - J			<0.22	<0.22	<0.22						
Freon-11	75-69-4	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA					NA	NA	NA		NA	NA			NA	NA	<0.29						
Freon-113	76-13-1	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA					NA	NA	200		NA	NA			NA	NA	<0.42	<0.42					
1,4-Dichlorobenzene	106-46-7	75	<2	<0.16	<2000	<32	<20	<0.16		<0.16	<2	<0.16	<2	1.20					4.9	1.3 - J	<6.4		<0.14	<16			<0.16	<0.16	<0.16						
1,2,4-Trimethylbenzene	95-63-6	NA	<2	<0.15	<2000	<30	<20	<0.15		<0.21	<2	<0.21	<2	<0.15					0.17 - J	1.8 - J	<6.0		<0.13	<15			<0.15	<0.15	<0.15						
Dichlorofluoromethane	75-71-8	NA	<2	<0.31	<2000	<62	<20	<0.31		0.59 - J	<2	<0.31	<2	0.81 - J					<0.31	<0.62	<12		<0.31	70 - J			<0.31	<0.31	<0.31						
Trans 1,2-DCE	156-60-5	140 or 100	<2	<0.15	<2000	<30	<20	<0.15		<0.15	<2	0.89 - J	<2	<0.13					<0.15	<0.30	<6		<0.15	33 - J			<0.15	<0.15	<0.15						
1,1-DCA	74-34-3	NA	<2	<0.22	<2000	<44	<20	<0.22		2	<2	<0.13	<2	0.50 - J					<0.22	8.2	17 - J		<0.21	95 - J			<0.22	<0.13	<0.13						
Cis-1,2-DCE	156-60-2	14 to 70	<2	<0.15	<2000	2000	<20	<0.15		<0.15	<2	4	<2	1.60					<0.17	7.9	<6		<0.15	1900			<0.15	<0.22	<0.22						
1,3,5-Trimethylbenzene	108-67-8	NA	<2	<0.16	<2000	<32	<20	<0.16		<0.16	<2	<0.16	<2	<0.16					<0.16	0.63 - J	<6.4		<0.16	<16			<0.16	<0.16	<0.16						
Chlorobenzene	108-90-7	100	<2	<0.17	<2000	<34	<20	<0.17		<0.17	<2	<0.17	<2	<0.17					0.49 - J	<0.34	<6.8		<0.17	<17			<0.17	<0.17	<0.17						
Chloroform	67-66-3	3.5	<2	<0.16	<2000	<32	<20	<0.16		0.24 - J	<2	<0.30	<2	<0.16					<0.32	<0.32	<6.4		<0.16	<16			0.60 - J	<0.16	<0.16						
Ethylbenzene	100-41-4	700	<2	<0.16	<2000	<32	<20	<0.16		<0.16	<2	<0.16	<2	<0.16					<0.16	2.0	<6.4		<0.16	<16			<0.16	<0.16	<0.16						
Isopropylbenzene	92-82-8	NA	<2	<0.19	<2000	<38	<20	<0.19		<0.19	<2	<0.19	<2	<0.19					<0.19	0.75 - J	<7.6		<0.19	<19			<0.19	<0.19	<0.19						
4-Isopropyltoluene	99-87-6	NA	<2	<0.20	<2000	<40	<20	<0.20		<0.20	<2	<0.20	<2	<0.20					0.37 - J	0.68 - J	<8.0		<0.20	<20			<0.20	<0.20	<0.20						
4-Methyl-2-pentanone (MIBK)	99-87-6	NA	<2	<0.98	<2000	<200	<20	<0.98		<5.0	<2	<0.98	<2	<0.98					0.98 - J	<2.0	<39		1.9 - J	<98			<5.0	<0.98	<0.98						
2-Butanone (MEK)	78-93-3	NA	<2	<2.0	526000	<400	<20	<2.0		3.9 - J	<2	<2.0	<2	<2.0					<2.0	<4.0	<80		<2.0	<200			<2.0	<2.0	<2.0						
1,1,1-TCA	71-55-6	14,000 or 200	<2	<0.16	<2000	<32	<20	<0.16		<0.16	<2	<0.27	<2	<0.16					<0.16	<0.32	<6.4		<0.16	<16			<0.16	<0.16	<0.16						
Methylene Chloride	75-09-2	5.6 or 5	<2	<0.32	<2000	<64	<20	<0.32		<0.32	<2	<0.32	<2	<0.32					<0.32	<0.64	26 - J 8		<0.32	<32			0.89 - J 8	<0.32	<0.32						
Naphthalene	91-20-3	140	<2	<0.22	<2000	<44	<20	<0.22		<0.22	<2	<0.22	<2	<0.22					<0.22	2.7	<8.8		<0.22	<22			<0.22	<0.22	<0.22						
N-Propylbenzene	103-65-1	NA	<2	<0.16	<2000	<32	<20	<0.16		<0.16	<2	<0.16	<2	<0.16					<0.16	0.63 - J	<6.4		<0.16	<16			<0.16	<0.16	<0.16						
Trichloroethylene (TCE)	79-01-6	2.8 to 5	<2	<0.24 - J	<2000	3600	<20	0.33 - J		0.29 - J	<2	11	<2	0.60 - J					<0.16	<0.40	1500		<0.16	3200			<0.20	<0.20	<0.20						
Toluene	108-88-3	560 to 1,000	<2	<0.17	68000	<34	1190	0.17 - J		<0.17	<2	<0.17	<2	<0.17					0.17 - J	5.9	<6.8		<0.17	<17			<0.17	0.17 - J	<0.20						
Tetrachloroethylene (Perc)	127-18-4	17 or 5	<2	<0.20	<2000	<40	<20	<0.20		<0.20	<2	4.7	<2	0.55 - J					<0.20	<0.40	<8.0		<0.20	<20			<0.20	<0.20	<0.20						
Tetrahydrofuran (THF)	109-99-9	6300	<2	<2.0	<2000	<410	<20	<2.0		<2.0	<2	18	<2	<2.0					<2.0	61	99 - J		<2.0	530 - J			<2.0	<2.0	<2.0						
Vinyl Chloride	75-01-4	0.023 to 2	<2	<0.10	<2000	<20	<20	<0.10		<0.10	<2	1.3	<2	<2					<0.10	21	<4.0		<0.10	300			<0.10	<0.10	<0.10						
Xylenes - Total	1330-20-7	1,400 to 10,000	<2	<0.19	<2000	<38	<20	<0.19		<0.19	<2	<0.19	<2	<0.19					<0.19	3.8 - J	<7.6		<0.19	<19			<0.19	0.23 - J	<0.19						
1,2 DCE	107-6-2	7	<2	<0.13	<2000	2000	<20	<0.13		<0.13	<2	5	<2	<0.13					<0.13	<0.13	<0.13		<0.13	1900			<0.13	<0.13	<0.13						
Remaining VOC's are ND			<2	<0.20	<2000	<38	<20	<0.20		<0.19	<2	<0.2	<2	<0.20					<0.20	<0.20	<6		<0.2	<20			<0.2	<0.2	<0.2						
SOC's (Method 8270) ug/l																																			
1,4 - Dioxane	123-91-1	0.35	<2	<2	80	67	<2		Laboratory Missing Sample - not analyzed	11	<2		<2		Dry - No Sample	Dry - No Sample	Not Installed - on Waste Connections Property	Not Installed - on Waste Connections Property	12	64	41	Dry - No Sample	<2	35	Dry - No Sample	Dry - No Sample	<2	<2	<1.6						
Benzo(g,h,i)perylene	191-24-2	NA	<2	<2	<2	<2	<2			<2	<2	<2	<2						<2	<2	<2		<2	23			<2	<2	<2						
Benzoic Acid	65-85-0	NA	<20	<20	70.0	<20	<2	<2		<20	<20	<20	<20						<20	<20	<20		<20	<20			<20	<20							
Benzyl alcohol	100-51-6	NA	<2	<2	15.0	<2	<2	<2		<2	<2	<2	<2	<2					<2	<2	<2		<2	<2			<2	<2	<2						
Bis(2-ethylhexyl) phthalate	117-81-7	6.0	<4	<4	<3	54	<2	<2		<4	<4	<4	<4	<4					<4	<4	<4		<4	<4			<4	<4	<4						
Di-n-octyl phthalate	117-84-0	NA	<2	<2	<2	<2	<2	9 - J		<2	<2	<2	<2	<2					<2	<2	<2		<2	5 - J			<2	<2	<2						
2-Methylphenol	95-48-7	NA	<2	<2	133	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	6 - J	<2	<2	<2														
Indeno(1,2,3-cd)pyrene	193-39-5	NA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	10.00	<2	<2	<2														
Remaining SOC's are ND			<2	<2	<3	<3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2														
Total Organic Carbon mg/l	7440-44-0	NA	10.5	15.6	568	31.5	42.6	47.1	No Sample	41.2	39.4	40.0	39.4	48.3	No Sample	No Sample	No Sample	No Sample	29.9	87.3	38.4	No Sample	151.0	1.0	No Sample	No Sample	6.7	15.9	20						
Metals mg/l																																			
Antimony	7440-36-0	0.006	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03	<0.03	<0.03					<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03							
Arsenic	7440-38-2	0.010	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02					<0.02	0.072	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02								
Barium	7440-39-3	2.000	0.172	0.048	0.092	0.097	0.066	0.054		0.033	0.062	0.033	0.062	0.047					0.119	0.251	0.056	0.084	0.025	0.059	0.08	0.08	0.08								
Beryllium	7440-41-7	0.004	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		0.00066	0.01	<0.0005	0.01	<0.0005					<0.0005	<0.0005	0.0008	<0.0005	0.01	<0.0005	<0.0005	0.0006	0.0006								
Cadmium	7440-43-9	0.005	0.001	<0.003	<0.003	<0.003	<0.003	<0.003		<0.003	0.001	<0.003	0.001	<0.003					<0.003	<0.003	<0.003	<0.003	0.006	<0.003	<0.003	<0.003	<0.003								
Calcium	7440-70-2	NA	223	315	231	455	387	393		420	427	292	427	457					331	349	480	427	407	213	408	391	391								
Chromium	7440-47-3	0.100	<0.005	<0.005	0.01	<0.005	<0.005	<0.005		<0.005	0.018	<0.005	0.018	<0.005																					



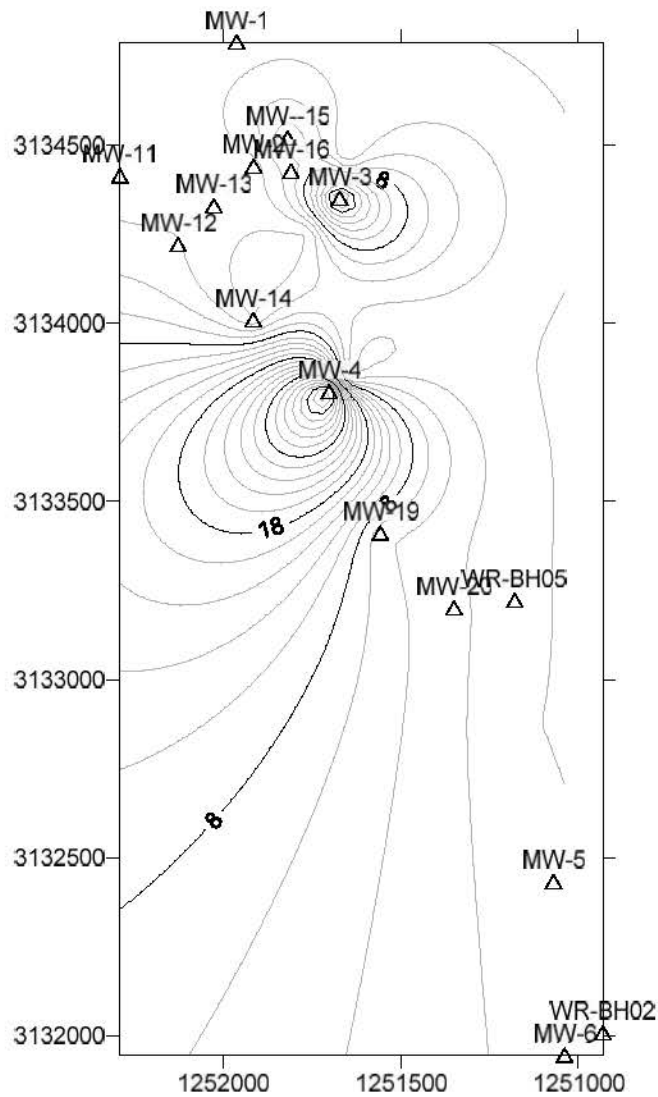
 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE		PROPERTY LOCATION Stratus Redtail Ranch, LLC Phase 2 Investigation Cis 1,2 – DCE Concentrations	FIGURE 2—5A
PROJECT NUMBER 4838-001	DATE July 2017		


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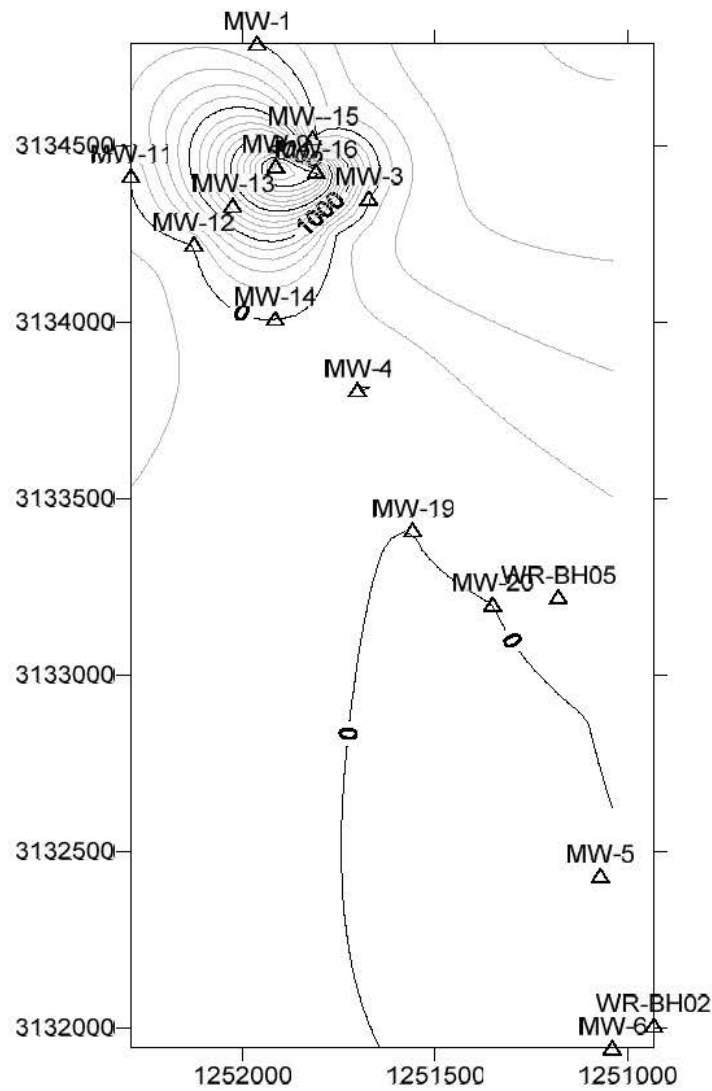
 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE		PROPERTY LOCATION Stratus Redtail Ranch, LLC Phase 2 Investigation MEK Concentrations	FIGURE 2—5B
PROJECT NUMBER 4838-001	DATE July 2017		


wp files\4263.001\figure 1 - site location.cdr



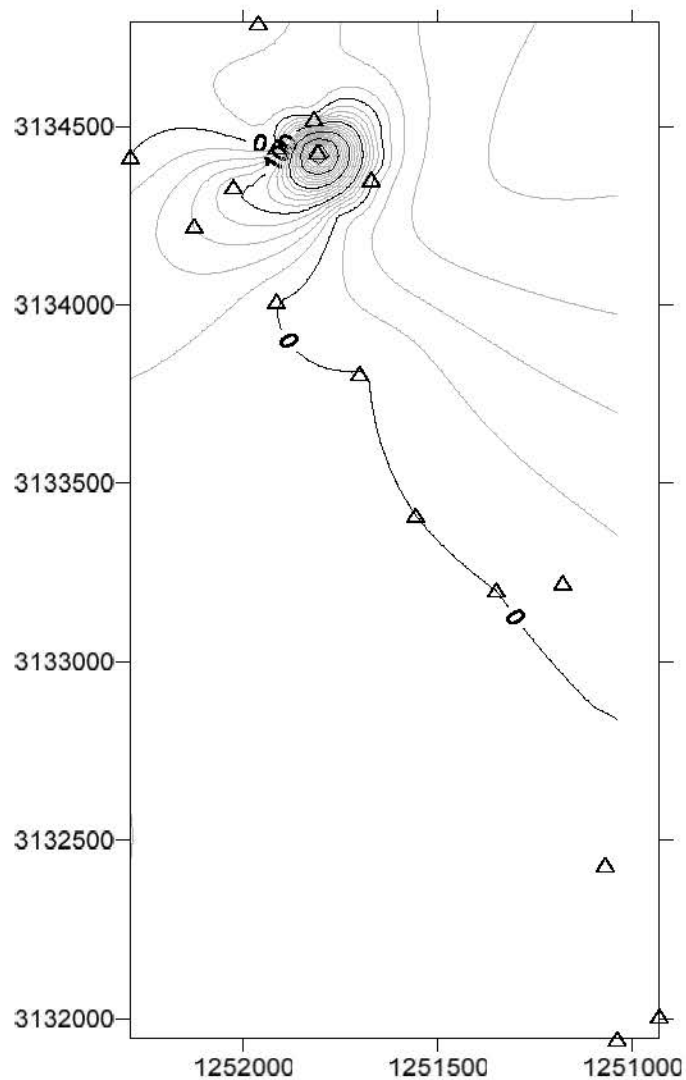
 <div>STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE</div>		PROPERTY LOCATION	FIGURE 2—5C
PROJECT NUMBER 4838-001	DATE July 2017	Stratus Redtail Ranch, LLC Phase 2 Investigation Nitrate	


wp files\4263.001\figure 1 - site location.cdr



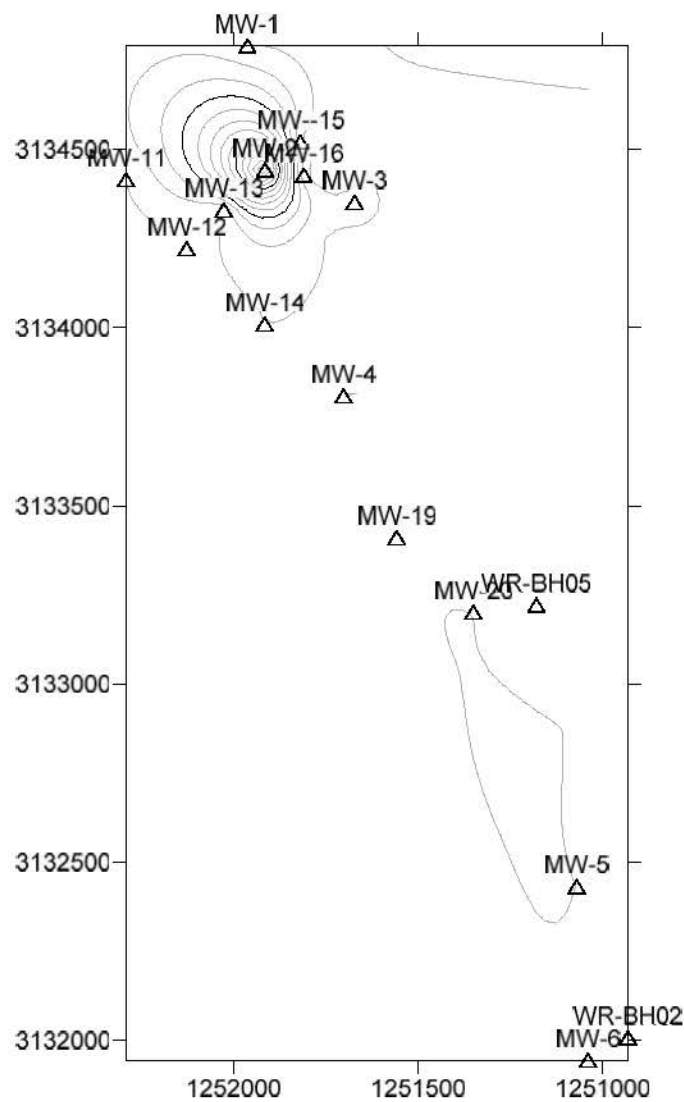
 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC <small>ENGINEERING FOR LIFE</small>		PROPERTY LOCATION Stratus Redtail Ranch, LLC Phase 2 Investigation TCE	FIGURE 2—5D
PROJECT NUMBER 4838-001	DATE July 2017		


wp files\4263.001\figure 1 - site location.cdr



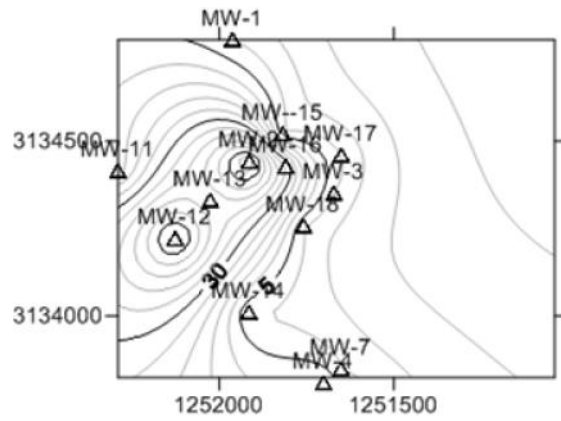
 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC <small>ENGINEERING FOR LIFE</small>		<small>PROPERTY LOCATION</small> Stratus Redtail Ranch, LLC Phase 2 Investigation THF	FIGURE 2—5E
<small>PROJECT NUMBER</small> 4838-001	<small>DATE</small> July 2017		

wp files\4263.001\figure 1 - site location.cdr




 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE		PROPERTY LOCATION Stratus Redtail Ranch, LLC Phase 2 Investigation Toluene	FIGURE 2—5F
PROJECT NUMBER 4838-001	DATE July 2017		

wp files\4263.001\figure 1 - site location.cdr



Note: 1,4-Dioxane Levels west of MW-4 are non-detect.

 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE		PROPERTY LOCATION Stratus Redtail Ranch, LLC Phase 2 Investigation 1,4-Dioxane	FIGURE 2—5G
PROJECT NUMBER 4838-001	DATE July 2017		

wp files\4263.001\figure 1 - site location.cdr

2.6 Surface Water

The surface water was not sampled in this phase of the work.

2.7 Deviations in Shallow Groundwater Investigation

The groundwater investigation had the following deviations from the approved plan:

1. Originally, MW-7 was to be located further to the east. This location was moved as the agreed upon site was not accessible by the drill rig. This was verbally discussed and approved by CDPHE with email confirmation.
2. MW-8 was moved further to the west to capture the potential paleo channels further west on the Work Area. This was verbally discussed and approved by CDPHE with email confirmation.
3. Subject to obtaining an access agreement, MW-9 and MW-10 were to be installed on the Waste Connections property located to the west of the Work Area. As approved, MW-9 was to be on the west side of the Work Area, but in discussions with CDPHE, it was determined a better location was to the west which would place this well on the Waste Connections property. These wells were not installed as a site access agreement could not be negotiated. Stratus did agree to sample and close the old QMW-12 well. This well was sampled on August 23, 2017 and the well was closed on September 21, 2017. This was verbally discussed and approved by CDPHE with email confirmation.
4. MW-20 was moved closer to the paleo channel and the pond on the west side of the Work Area. This was verbally discussed and approved by CDPHE with email confirmation.
5. QMW8 was not closed until MW-13 showed water to be present. MW-13 showed water on the first day of drilling and therefore QMW-8 was closed. This was verbally discussed and approved by CDPHE with email confirmation.
6. Surface water was not sampled in this investigation since previous results were not indicating surface water contamination. This was verbally discussed and approved by CDPHE with email confirmation with the exception that surface water might need to be sampled in the future.
7. In order to obtain the lowest detection limit concentrations as noted in Appendix II of the Solid Waste Regulations, it was suggested by the contract labs that Methods 8260, 8270, and 8150 be utilized. After discussions with the various laboratories regarding detection limits, Methods 8010 and 8015 were not run, as the lab determined that the compounds were on the other methods and would be found at levels that matched the Appendix II Assessment Monitoring criteria. This was verbally discussed and approved by CDPHE with email confirmation.
8. During the sampling event, when shipping samples to ACZ in Steamboat Springs, Colorado, the carrier did not get the samples to the laboratory in the specified time. This resulted in samples needing to be re-sampled. This is noted in the laboratory reports and on the Chain of Custody.
9. Statistical analysis cannot be used at this time due to the limited number of samples from appropriate groundwater wells.

2.8 Groundwater Conclusions

The groundwater investigation conclusions are:

1. The shallow groundwater is continuing to exhibit flow from the east to the west.
2. The contaminants of Cis-1,2 DCE are similar to previous values
3. The MEK concentrations in the groundwater decreased significantly in the July 2017 sampling event, but this is likely due to moving the monitoring well MW-2R to the south approximately 10 feet. While MEK is found in other wells, the concentrations are significantly lower.
4. The nitrate values decreased significantly from the original monitoring of the site.
5. The TCE concentrations are similar to previous sampling results.
6. The THF concentrations are similar to previous sampling results
7. The Toluene concentrations are similar to previous sampling results.

3.0 BURIED DRUM INVESTIGATION

3.1 Introduction

Data regarding drums is found in the Preliminary Site Assessment (PSA) investigation in 1984 and a revised PSA in 1990. This investigation has found the drum locations based on the work performed by National Ground Penetrating Radar Services, Inc. (NGPRS) from July 11 to July 13, 2017 on site. This report is found in Appendix E. In addition, the locations of certain drum sites are consistent with the drawings provided in conjunction with the preparation of the PSA.

3.2 Ground Penetrating Radar and Electro-Magnetic Investigation

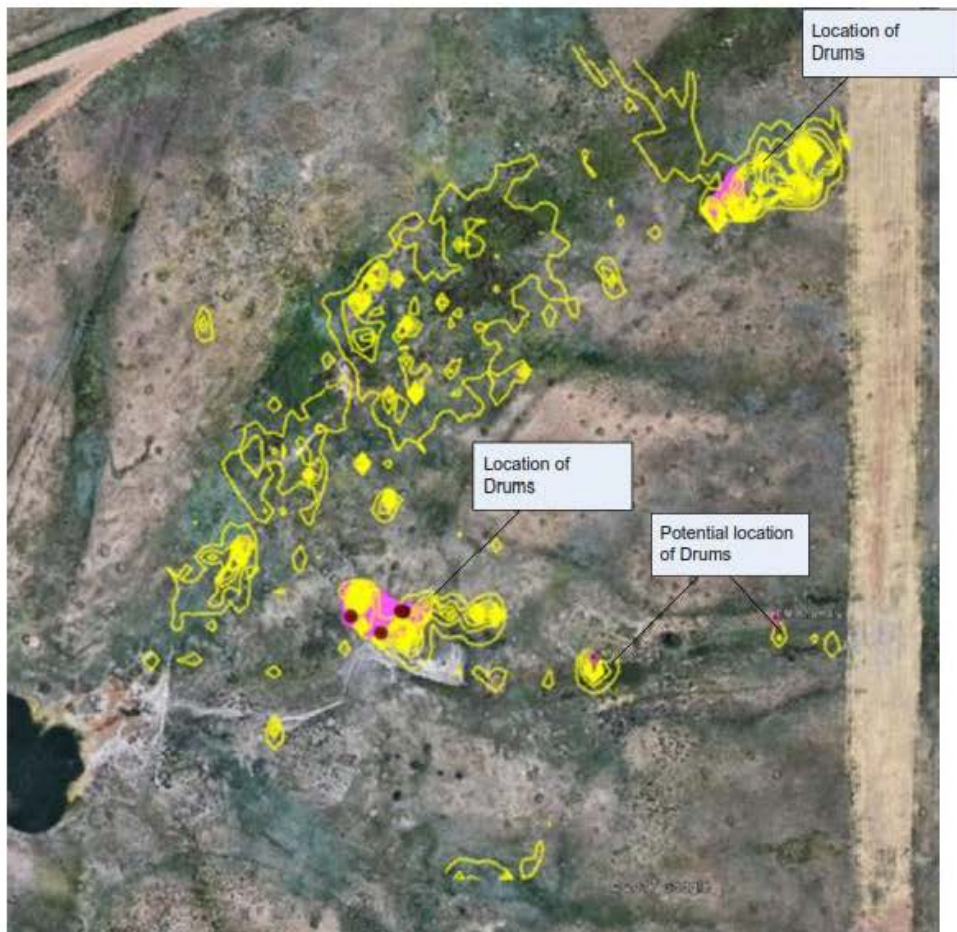
Two techniques were utilized to attempt to locate the drums at the site. The first was Ground Penetrating Radar (GPR). Due to the bentonite clay in the soil, the GPR technique did not work at this site. The other technique utilized at the site was an Electro-Magnetic (EM) survey. The EM technique did work at the site. As shown in Figure 3-1, several areas were located that contained large responses to metal. The EM responses are shown in "yellow". As noted in the NGRPS report, the areas on the north and east side of the Work Area have low responses to metal in the subsurface. NGPRS did not believe these represented buried drums. However, there were several areas which indicate a high response to metal. In the area 3 marked on Figure 3-1, these drums were partially exposed. The areas 1 and 2, which are located near MW-2, were also confirmed to contain buried drums with the use of test pits performed by JB Sittner.


This was again performed at a later date to provide this same observation for EPA and CDPHE in the field.

3.3 Field Verification of Drum Locations

In the field, these locations were verified with excavation by a front end loader. This occurred in both December 2016 and July 2017. In both instances, a sample of the liquid in the drums was obtained. The drums in Area 1 contained very high levels of MEK and toluene. The drums in Area 2 contained lower levels of MEK and toluene, but also contained chlorinated solvents. All of the drum locations were verified by the Land Surveyor at the site.

The data for these drums is found in Table 3-1. The laboratory reports for this information are found in Appendix A.



 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE		PROPERTY LOCATION Stratus Redtail Ranch, LLC Phase 2 Investigation EM Investigation	FIGURE 3-1
PROJECT NUMBER 4838-001	DATE July 2017		

wp files\4263.001\figure 3 - site location.cdr

3.4 Drum Liquid Testing and Comparison to IBM Waste

The RPA in 1990 provided information from IBM on the waste constituents. As shown in Table 3-1, the test results from the drums were compared to the information provided by IBM. As shown in the table, the constituents are closely tied together.

Drum Location	East Drum Sampled Jan 17	West Drum Sampled July 17	40 CFR 261.24 Regulatory Limit (20:1 Dilution)	EPA ID Number	IBM 1981 Generator Report - Waste Identification
VOC's (Method 8260)	All Values are in mg/l (PPM)				
1,4-Dichlorobenzene	<2,500	<4,400			
Cis-1,2-DCE	<2,500	<3,000			
1-1, DCE	<2,500	<4,600			
Isopropylbenzene	<2,500	<3,800			
Isopropyltoluene, 4-	<2,500	<3,800			
Trimethylbenzene, 1,2,4-	<2,500	<4,200			
Trimethylbenzene, 1,3,5-	<2,500	<3,200			
2-Butanone (MEK)	530000	220000	4000	D035	Present
butylbenzene, n-	<2,500	<6,400			
Trichloroethylene (TCE)	<2,500	32000	10	D040	Present
Toluene	2700	760000	NA	NA	Present
Tetrachloroethylene (Perc)	<2,500	<4,000			
Tetrahydrofuran (TFA)	<2,500	<41,000			Present
Vinyl Chloride	<2,500	<2,000			
Xylenes - Total	<2,500	<3,800			
Remaining VOC's are ND	<2,500	<4,400			
SOC's (Method 8270)	All Values are in mg/l (PPM)		40 CFR 261.24 Regulatory Limit (20:1 Dilution)	EPA ID Number	
1,4 - Dioxane	<2,000	NA			
Benzoic Acid	<2,000	NA			
Bencyl alcohol	<2,000	NA			
Bis(2-ethylhexyl) phthalate	<2,000	NA			
2-Methylphenol	<2,000	NA			
Pentachlorophenol	<1,000	NA			
Remaining SOC's are ND	<2,000	NA			

Table 3-1 – Drum Investigation Sample Results

In the 1981 Generator Report for IBM, these constituents were detected as part of IBM's reporting to EPA. As noted, THF was within the mixture of the solvent drums. While the detection limit is too high for the detection of THF, there is THF in low concentrations in the groundwater. This chemical is non-reactive and therefore will be a leading indicator of contamination.

Table 3-1, also identifies the hazardous characterization of the liquid within the drums. As shown, one of the samples would be characterized as hazardous due to the MEK and TCE concentrations. The sample is also likely ignitable under the characteristic standard.

3.6 Drum Investigation Plan Deviation

We did not anticipate finding additional drums to the west of MW-2R. When the EM technology found these additional drums, CDPHE and Stewart had JB Sittner uncover the drums which provided an opportunity to sample of the liquid within the drums was obtained.

3.7 Drum Investigation Conclusions

The conclusions of the drum investigation are:

1. There are buried drums at the site.
2. Some of the drums at the site contain liquids which are considered hazardous
3. The number of drums and the amount of liquid at the site in the drums is unknown at this time.
4. The general area of where the drums have been located and surveyed.

4.0 IDENTIFICATION AND LOCATION OF SOLID WASTE

4.1 Introduction

The waste at this site is identified in two different areas: (1) buried drums at the site, which is discussed in Section 3 of this report and (2) solid waste, which consists mainly of residential and commercial/industrial trash. Part of the trash identified at the site is magnetic tape from IBM, which has been identified by IBM logos in the trash. As part of this investigation, these areas were identified through the use of test pits and Electro Magnetic surveys. The test pits are shown at the various locations where trash was identified in Figure 4-1.

4.2 Ground Penetrating Radar and Electro-Magnetic Survey

4.2.1 East Side Investigation

The buried drums on the east side of the site are discussed in Section 3. However, there are two other anomalies east of MW-2 which might indicate a drum. The EM survey also identified other metal products, but these were found to be metal items that were not drums.

4.2.2 West Side Investigation

The west side of the site also had an EM survey and did show two areas that might have drums. Both areas were excavated with a backhoe. The area, West 1, contained a car body and parts. The area, West 2, had a steel pressure tank. Neither area indicated contamination with solvents from barrels. This is consistent with the groundwater monitoring results.

4.3 Survey of Solid Waste Pits and EM Locations

The surveyor information of the solid waste pits is provided in Appendix F and on Figure 4-1. This figure provides the EM results as well as the location of the solid waste test pits. The surveyor located these sites 7 months after

excavation; some of the test pits were obvious while others were an estimate. Based on the test pit locations and combined with the EM results, there is a high degree of confidence that all of the areas of solid waste disposal have been identified.

In Figure 4-1, an estimate of the extent of solid waste is provided. This is based on previous aerial photos, the test pits and the EM survey. As shown on the figure, the east side of the extent of solid waste is approximately 8.5 acres and the west side is approximately 7.5 acres.

4.4 Solid Waste Site Conclusion

The solid waste conclusions are:

1. The site contains residential waste, magnetic tape and drums containing solvents which are classified as a characteristic hazardous waste.
2. The site was mapped using an EM technique and the test pits for the extent of the solid waste.
3. The site has approximately 17 acres (8.5 acres on the east side and 7.5 acres on the west side).

5.0 BEDROCK MAPPING

5.1 Introduction

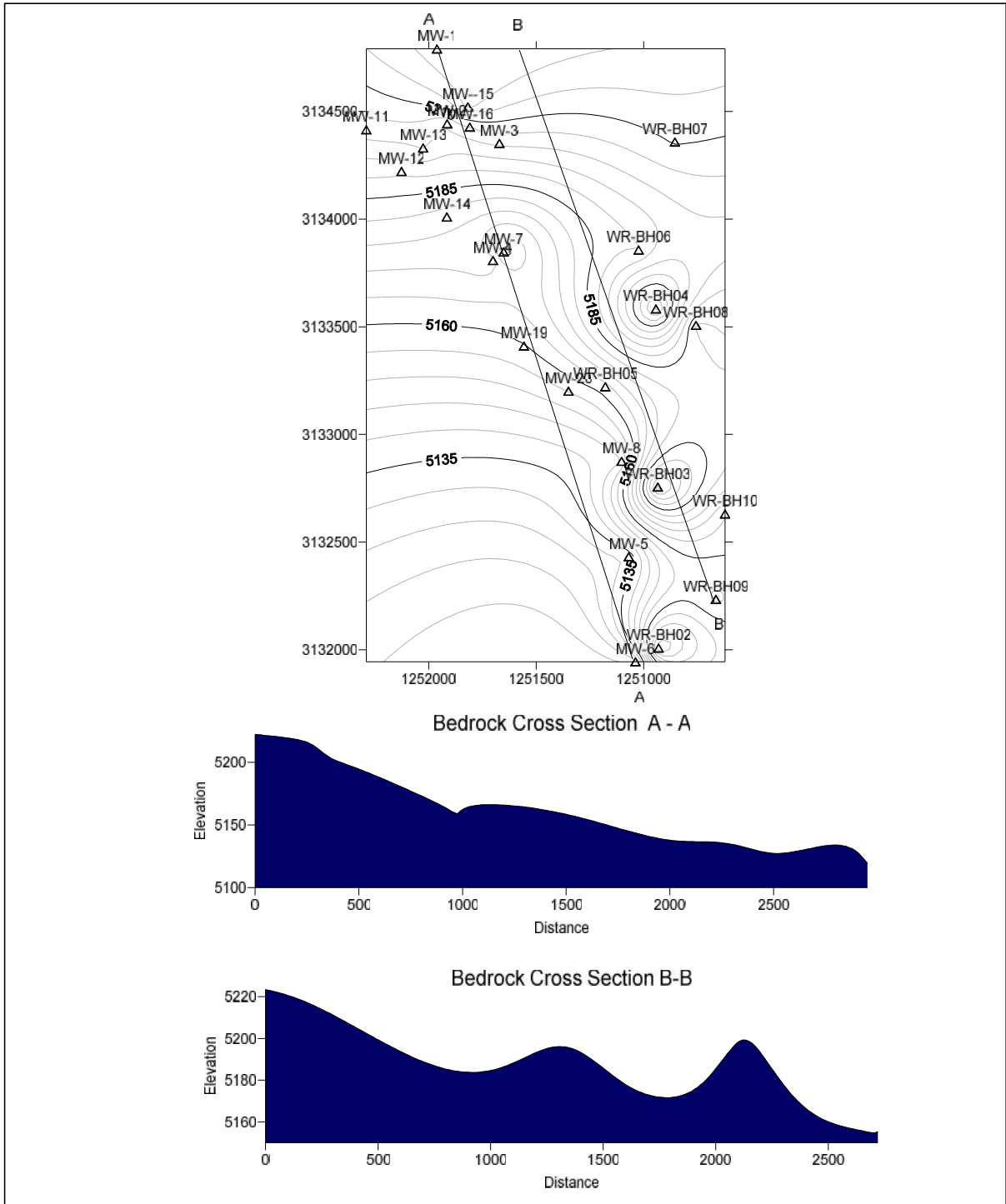
One of the objectives of this phase 2 investigation is to develop a bedrock map to determine whether the existence of bedrock at the site may prevent contaminated groundwater from the site moving to the southern area of the Stratus property where the proposed residential development is planned. The depth of the bedrock along the southern boundary of the Work Area was confirmed in the NGPRS study at approximately 5 feet below the surface of the site. This was tested along the entirety of the south boundary from County Road 5 to the east side of the Work Area for approximately 800 feet to the west of County Road 6.


5.2 Surfer 14 Model Results

5.2.1 Bedrock Isopleths

The bedrock isopleths map is provided in Figure 5-1. As shown, the bedrock has several “holes” on the east side of the site. As shown on the bedrock map, the area between MW-4/MW-7 and MW19, the bedrock flattens. MW-4/MW-7 are in the same paleo channel as MW-19. While the surface shows a flow channel, the bedrock surface shows a hole near MW-4/MW-7. This likely result in the low spot for the channel and water does not flow past this point. Also note that the bedrock depth in MW-19 and MW-20 is very shallow in being just a few feet in depth. This adds to the confirmation of a dry area for the two sites.

As noted in discussions with CDPHE, the groundwater can rise and fall with seasonality. Therefore, additional samples and groundwater measurements will be obtained in the future to provide additional information on the bedrock and groundwater interaction.

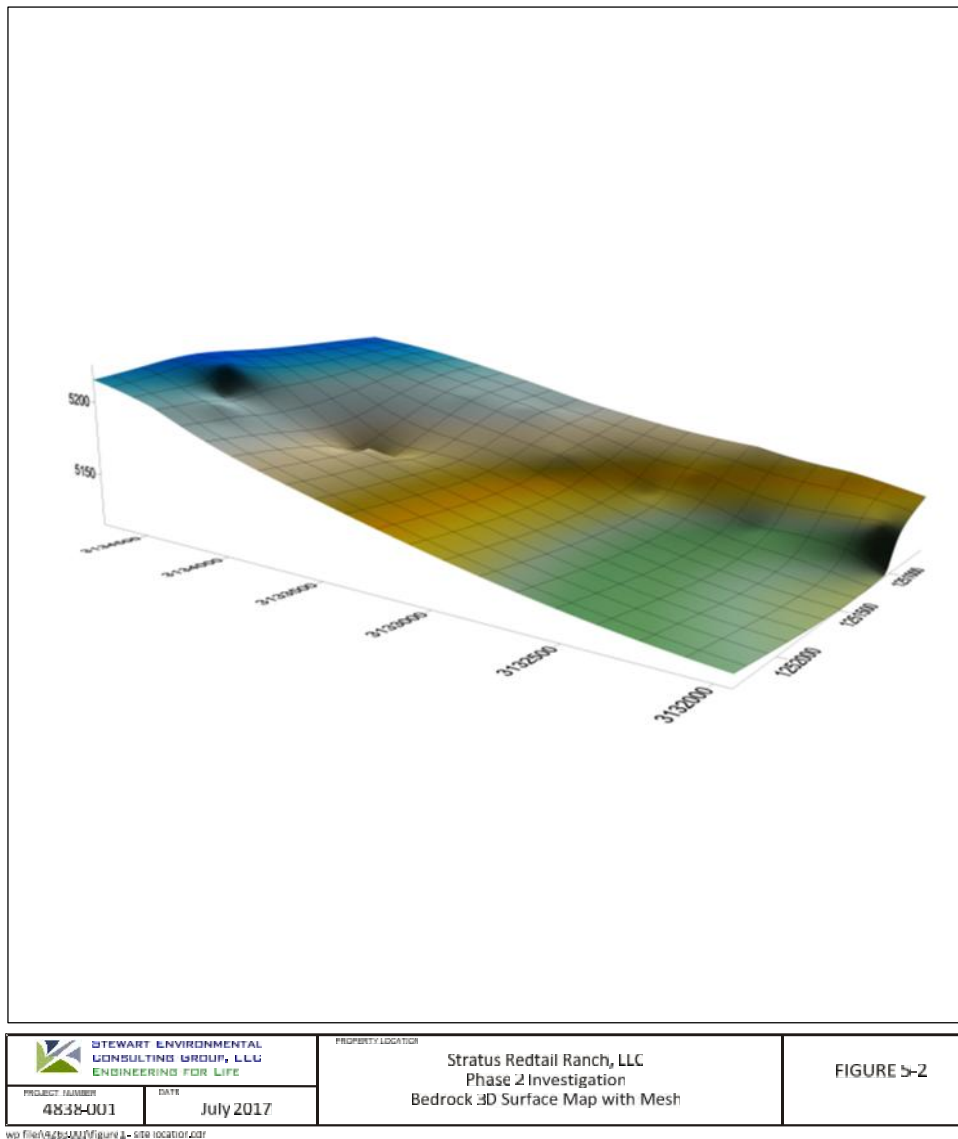


<div>  <div> STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE </div> </div> <div> <div>PROJECT NUMBER</div> <div>DATE</div> </div> <div> 4838-001 July 2017 </div>		<div>PROPERTY LOCATION</div> <div> Stratus Redtail Ranch, LLC Phase 2 Investigation Bedrock Contour Isopleth Map </div>	<div>FIGURE 5-1</div>
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wp files\4263.001\figure 1 - site location.cdr

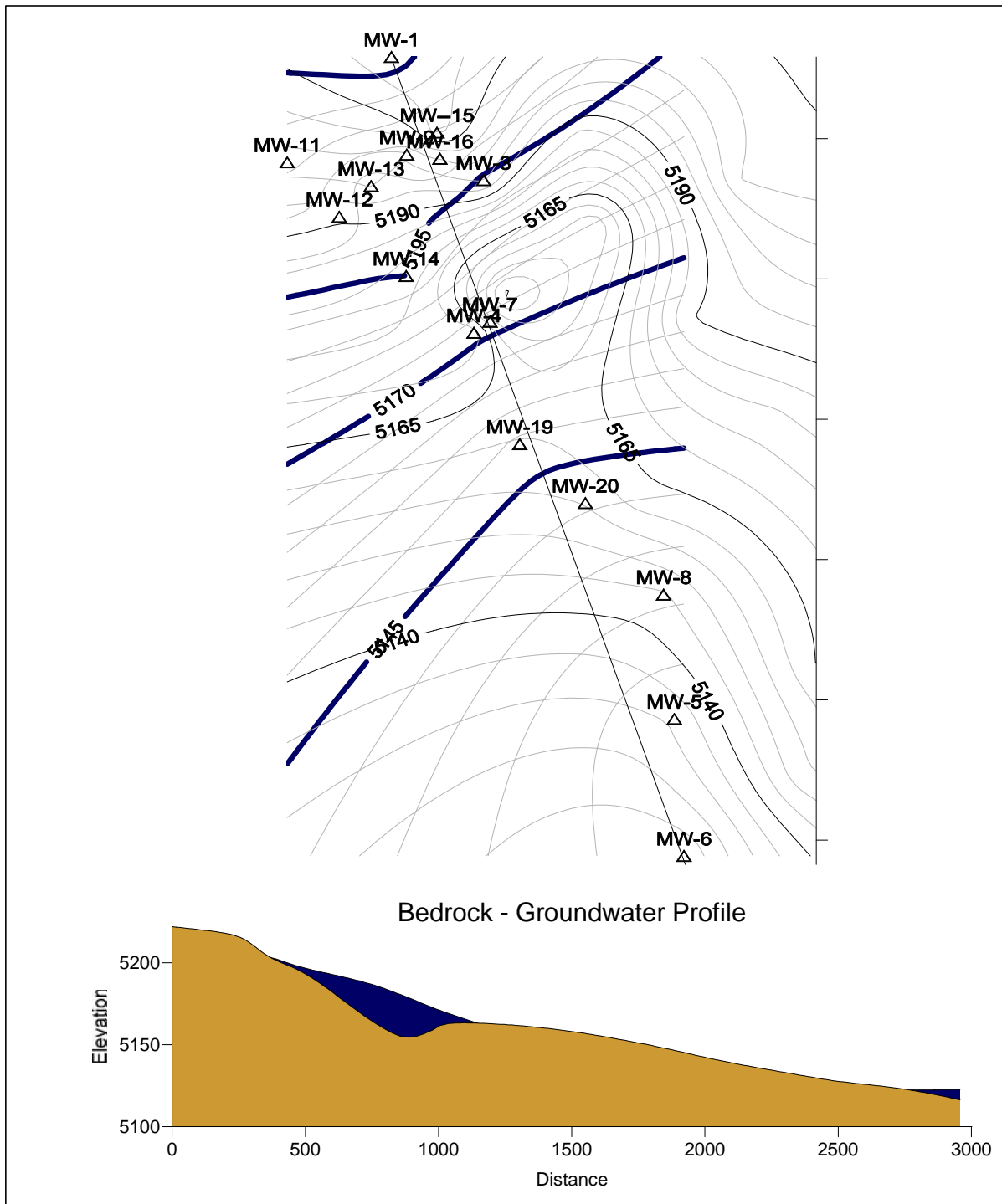
5.2.2 Bedrock 3 Dimensional Model


We also developed a 3D model of the bedrock to allow for different views of the site. A 3D view is provided in Figure 5-2 and the model which can be manipulated is found on the Stratus – CDPHE drop box.



5.3 Bedrock and Groundwater Interaction

The bedrock and shallow groundwater interaction is provided in Figure 5-3. As shown in this figure, the groundwater would need to surface prior to reaching the top of the bedrock on the south side of the site.



 STEWART ENVIRONMENTAL CONSULTING GROUP, LLC ENGINEERING FOR LIFE		PROPERTY LOCATION Stratus Redtail Ranch, LLC Phase 2 Investigation Bedrock – Groundwater Interaction	FIGURE 5-3
PROJECT NUMBER 4838-001	DATE July 2017		

wp files\4263.001\figure 1 - site location.cdr

5.4 Bedrock Mapping Conclusions

Based on the investigation performed, the following conclusions can be reached:

1. The bedrock has a definite high elevation on the south side of the site.
2. The bedrock high will prevent shallow groundwater from migrating to the south towards the proposed residential area. This is based on the groundwater elevations being 15 feet below the top of the bedrock surface to the south
3. The bedrock also indicates a dry area between the east and west sides of the site. This is due to a hole near MW-4/MW-7 and very shallow bedrock near MW-19 and MW-20.
4. There were not any deviations in the bedrock mapping from the approved plan.

6.0 BIOREMEDIATION TESTING

The bioremediation testing was performed at the site. The testing included the following:

1. Samples were obtained from the site in July 2017.
2. These samples were transported to North Carolina with the procedures listed in the approved plan.
3. The samples were then treated with a microbiological mixture to accelerate the removal of VOC and chlorinated solvents from the soil.
4. The samples obtained a non-detect value for all solvents. However, the baseline was also very low or non-detect so it is difficult to project if this removal was through volatilization or through microbiological actions.
5. The bioremediation company has concluded that bioremediation would remove all VOC's to non-detect values and would allow for replacement of the remediated soil back into the site. This would reduce or eliminate the amount of soil that would be disposed of in a landfill.

7.0 PHASE TWO INVESTIGATION RECOMENDATIONS

1. Stratus believes that shallow groundwater conditions have been fully investigated and continued monitoring should be considered.
2. Stratus believes that identification of solid waste locations has been completed.
3. While nothing in the report indicates that the intact drums that have been on site for approximately 50 years are creating an imminent threat or otherwise contributing contaminants to the soil or groundwater, Stratus is entering into an agreement with the U.S. Environmental Protection Agency to undertake an EPA approved drum removal action.
4. Stratus understands that CDPHE believes additional deep water investigation needs to occur at the site.
5. Stratus believes that the investigation done to date is sufficient and a remedial plan should be considered.

REFERENCES

- ¹ Ground-Water Monitoring Plan Under RCRA Subtitle D for Denver Regional Landfill South, Doty and Associates, September 16, 1994
- ² Geotechnical Site Development Study for Redtail Ranch, Northwest of Weld County Road 4 and Weld County Road 6, Erie Colorado, AG Wassenaar, Inc, April 28, 2016, Project Number 160388

LABORATORY REPORT



Business

Stratus Companies

Attn: Dave Stewart

Laboratory



Stewart Labs, LLC
2600 Canton Ct. Unit C
Fort Collins, CO 80525
(970) 226-5500

Reference Information

Project: Stratus Redtail Ranch July and August 2017 Sampling

Date of Lab Report: 10/17/17

Re: Stratus Companies

Attn: Dave Stewart

Attached are the results for sample(s) received during the month of July and August 2017.

The analytical results relate only to the samples tested.

"I certify that these analyses and resulting report(s) were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly analyze all samples and accurately reported the results."

"I certify that all analyses were performed at Stewart Environmental Lab are in accordance with methods approved for WASTEWATER under the latest revision to 40 CFR Part 136. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for analyzing the water samples and generating the report(s), the analyses, report, and information submitted is to the best of my knowledge and belief, true, accurate, and complete."

This report contains 526 pages (including the cover page).

If you have any questions concerning this report, please do not hesitate to call (970) 226-5500, e-mail lab.manager@stewartenv.com, or Fax us at (970) 226-4946.

Respectfully Submitted,
Trevor Mueller

Project Manager/Lab Manager

This report shall not be reproduced except in full, without written approval of the laboratory.

Laboratory Report

Client:
Stratus Companies

Date Sampled: 7/10/2017 8:45:00 AM
Date Received: 7/11/2017
Batch No: 2456642
Laboratory ID: S171931155
Matrix: Wastewater Grab
Sample Name: MW-1

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out	Laboratory
. VOC 8260 Batch #	991376	Report #	0.002	EPA 8260 B	7/17/2017		<input type="checkbox"/>	
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>	
Antimony	<0.03	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Arsenic	<0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>	
Barium	0.048	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>	
Beryllium	<0.0005	ppm	0.0005	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Cadmium	<0.003	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Calcium	315	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>	
Chromium	<0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Cobalt	0.003	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Copper	0.006	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>	
Lead	<0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Magnesium	92.8	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Nickel	0.011	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Potassium	4.84	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Selenium	<0.01	ppm	0.01	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Silver	<0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Sodium	520	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Thallium	<0.1	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>	
Vanadium	<0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>	
Zinc	0.07	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>	

See Test America Report 280-99137-6 pgs

8260B:

Acetone: 32 ug/L

Trichloroethene: 0.24 ug/L J value



Stewart Labs LLC

2600 Canton Ct. Suite C Fort Collins, CO 80525

Phone 970-226-5500 ♦ Fax:970-226-4946

Client:
Stratus Companies

Date Sampled: 7/12/2017 12:00:00 PM
Date Received: 7/13/2017
Batch No: 2456682
Laboratory ID: S171941418
Matrix: Wastewater Grab
Sample Name: MW-1

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. SVOC 8270	3841701	Report #	10	EPA 8270	7/21/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
Total Organic Carbon	3841701	Report #	1	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.

See ACZ Report L38417-01 pgs. 2, 6 and 7, of 18.

SVOC 8270C: ND
TOC: 15.6 mg/L



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Phone 970-226-5500 ♦ Fax:970-226-4946

Client:
Stratus Companies

Date Sampled: 7/20/2017 2:00:00 PM
Date Received: 7/20/2017
Batch No: 2456797
Laboratory ID: S17202112F
Matrix: Wastewater Grab
Sample Name: MW-1

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Cyanide, Total	9951615	Report #	0.002	EPA 335.2	8/1/2017		<input checked="" type="checkbox"/> Test America
Sulfide	< 0.1	Dig #	0	SM 4500 S2- G	7/25/2017	JDM	<input type="checkbox"/>

See Test America Report 280-99516-15 pg 6 of 34.
Cyanide, Total: 0.0080 mg/L J value



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2600 Canton Ct. Suite C Fort Collins, CO 80525
Phone 970-226-5500 ♦ Fax:970-226-4946

Client:
Stratus Companies

Attn: Dave Stewart

Date Sampled: 7/6/2017 3:00:00 PM
Date Received: 7/6/2017
Batch No: 2456586
Laboratory ID: S172361145
Matrix: Wastewater Grab
Sample Name: M.W. 1

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Bicarbonate	698	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Carbonate	<2	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Mercury	995161	Report #	3E-05	EPA 245.1	7/27/2017		<input checked="" type="checkbox"/> Test America
Nitrate + Nitrite as N	0.876	ppm	0.1	EPA 300.0	7/8/2017		<input type="checkbox"/>
Sulfate	1583	ppm	0.5	EPA 300.0	7/8/2017		<input type="checkbox"/>

See Test America Report 280-99516-1 pg 5 of 34.
Mercury: 0.033 ug/L J value

Results Approved by:



Project Manager/Lab Manager

Date Reported: 10/5/2017

I certify that these analyses and resulting report(s) were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly analyzed all samples and accurately reported the results.



Stewart Labs LLC

2600 Canton Ct. Suite C Fort Collins, CO 80525
Phone 970-226-5500 ♦ Fax: 970-226-4946

Laboratory Report

Client:
Stratus Companies

Date Sampled: 7/17/2017 3:00:00 PM
Date Received: 7/18/2017
Batch No: 2456753
Laboratory ID: S17199173C
Matrix: Wastewater Grab
Sample Name: MW-2R

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. SVOC 8270	3858101	Report #	0.004	EPA 8270	7/31/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
. VOC 8260 Batch #	993295	Report #	0	EPA 8260 B	7/25/2017		<input checked="" type="checkbox"/> Test America
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>
Antimony	<0.03	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Arsenic	<0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Barium	0.097	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Beryllium	<0.0005	ppm	0.0005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Bicarbonate	2004	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Cadmium	<0.003	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>
Calcium	455	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Carbonate	<2	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Chromium	<0.005	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Cobalt	0.004	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Copper	0.007	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Cyanide, Total	993295	Report #	0.002	EPA 335.2	7/25/2017		<input checked="" type="checkbox"/> Test America
Lead	<0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Magnesium	118	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>
Mercury	995162	Report #	3E-05	EPA 245.1	7/27/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.018	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	0.995	ppm	0.1	EPA 300.0	7/19/2017		<input type="checkbox"/>
Phenols	3858101	Report #	0.003	SM 5530 D	8/9/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
Potassium	27	ppm	0.1	EPA 200.7	8/16/2017		<input type="checkbox"/>
Selenium	<0.01	ppm	0.01	EPA 200.7	8/16/2017		<input type="checkbox"/>
Silver	<0.005	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Sodium	1100	ppm	0.1	EPA 200.7	8/16/2017		<input type="checkbox"/>
Sulfate	3628	ppm	0.5	EPA 300.0	7/19/2017		<input type="checkbox"/>
Thallium	<0.1	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Total Organic Carbon	3858101	Report #	1	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
Vanadium	<0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Zinc	0.069	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>



Stewart Labs LLC

2600 Canton Ct. Suite C Fort Collins, CO 80525
Phone 970-226-5500 ♦ Fax:970-226-4946

Client:
Stratus Companies

Date Sampled: 7/17/2017 3:00:00 PM
Date Received: 7/18/2017
Batch No: 2456753
Laboratory ID: S17199173C
Matrix: Wastewater Grab
Sample Name: MW-2R

Attn: Dave Stewart

See Test America Report # 280-99329-5 pg. 6 of 31.

VOC 8260:

1, 2-Dichloroethene, Total: 2000 ug/L

cis-1, 2-Dichloroethene: 2000 ug/L

Trichloroethene: 3600 ug/L

Cyanide, Total: 0.0020 mg/L J value-result less than RL but greater than or equal to the MDL-approximate value. B value- compound was found in the blank and the sample. F1 value-MS and MSD recovery is outside acceptance limits.

See Test America Report 280-99516-2 pg 5 of 34.

Mercury: 0.030 ug/L J value

See ACZ Report L38581 pgs. 2, 6 and 7 of 18.

Phenol: 0.006 mg/L

Total Organic Carbon: 31.5 mg/L

SVOC:

1,4-Dioxane: 67 ug/L

Bis (2-ethylhexyl) phthalate: 54 ug/L

Results Approved by:


Project Manager/Lab Manager

Date Reported: 10/5/2017

I certify that these analyses and resulting report(s) were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly analyzed all samples and accurately reported the results.



Stewart Labs LLC

2600 Canton Ct. Suite C Fort Collins, CO 80525

Phone 970-226-5500 ♦ Fax:970-226-4946

Laboratory Report

Client:
Stratus Companies

Date Sampled: 7/20/2017 3:30:00 PM
Date Received: 7/21/2017
Batch No: 2456797
Laboratory ID: S17202112J
Matrix: Wastewater Grab
Sample Name: MW-2R

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out	Laboratory
Sulfide	<0.1	ppm	0.1	SM 4500 S2- G	7/25/2017	JDM	<input type="checkbox"/>	



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Laboratory Report

Client:
Stratus Companies

Date Sampled: 7/10/2017 8:45:00 AM
Date Received: 7/11/2017
Batch No: 2456642
Laboratory ID: S17193115A
Matrix: Wastewater Grab
Sample Name: MW-3

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. VOC 8260 Batch #	991374	Report #	0.001	EPA 8260 B	7/17/2017		<input checked="" type="checkbox"/> Test America
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>
Antimony	< 0.03	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>
Arsenic	< 0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Barium	0.054	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Beryllium	< 0.0005	ppm	0.0005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Bicarbonate	647	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Cadmium	< 0.003	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Calcium	393	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Carbonate	< 2	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Chromium	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Cobalt	0.003	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Copper	0.007	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Lead	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Magnesium	122	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Mercury	995163	Report #	3E-05	EPA 245.1	7/27/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.028	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	24.5	ppm	0.1	EPA 300.0	7/12/2017		<input type="checkbox"/>
Potassium	16.9	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Selenium	0.203	ppm	0.01	EPA 200.7	8/16/2017		<input type="checkbox"/>
Silver	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sodium	2300	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sulfate	7091	ppm	0.5	EPA 300.0	7/12/2017		<input type="checkbox"/>
Thallium	< 0.1	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Vanadium	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Zinc	0.069	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>

See Test America Report 280-99137-4 pgs 15 and 16 of 43.

Acetone: 28 ug/L

Toluene: 0.17 ug/L

Trichloroethene: 0.33 ug/L

See Test America Report 280-99516-3 pg 5 of 34.

Mercury: <0.027 ug/L



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Client:
Stratus Companies

Date Sampled: 7/17/2017 2:00:00 PM
Date Received: 7/18/2017
Batch No: 2456753
Laboratory ID: S17199173B
Matrix: Wastewater Grab
Sample Name: MW-3

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Cyanide, Total	993292	Report #	0.01	EPA 335.2	7/25/2017		<input checked="" type="checkbox"/> Test America
Total Organic Carbon	3858201	Report #	1	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.

See Test America report # 280-99329-2 pg 6 of 31.

Cyanide, Total: ND < 0.010 ug/L

See ACZ Report L38582-01 pg. 2 of 8.

Total Organic Carbon: 47.1 mg/L

Results Approved by:



Project Manager/Lab Manager

Date Reported: 10/5/2017

I certify that these analyses and resulting report(s) were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly analyzed all samples and accurately reported the results.



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Laboratory Report

Client:
Stratus Companies

Date Sampled: 7/20/2017 3:10:00 PM
Date Received: 7/21/2017
Batch No: 2456797
Laboratory ID: S17202112I
Matrix: Wastewater Grab
Sample Name: MW-3

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Cyanide, Total	9951619	Report #	0.002	EPA 335.2	8/1/2017		<input type="checkbox"/>
Sulfide	< 0.1	ppm	0.1	SM 4500 S2- G	7/25/2017	JDM	<input type="checkbox"/>

See Test America Report 280-99516-19 pg 6 of 34.
Cyanide, Total: <0.0020 mg/L B value-compund found in blank and sample.



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Client:
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Attn: Dave Stewart

Date Sampled: 7/27/2017 12:00:00 PM
Date Received: 7/27/2017
Batch No: 2456904
Laboratory ID: S172091532
Matrix: Wastewater Grab
Sample Name: MW-4

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. SVOC 8270	3881001	Report #	10	EPA 8270	8/16/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
. VOC 8260 Batch #	997071	Report #	0.0002	EPA 8260 B	8/7/2017		<input checked="" type="checkbox"/> Test America
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/14/2017		<input type="checkbox"/>
Antimony	< 0.03	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>
Arsenic	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Barium	0.033	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Beryllium	0.0006	ppm	0.0005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Bicarbonate	1464	ppm	2	SM 2320 B	7/31/2017		<input type="checkbox"/>
Cadmium	< 0.003	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Calcium	420	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>
Carbonate	< 2	ppm	2	SM 2320 B	7/31/2017		<input type="checkbox"/>
Chromium	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Cobalt	0.003	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Copper	0.009	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Cyanide, Total	997071	Report #	0.002	EPA 335.2	8/5/2017		<input checked="" type="checkbox"/> Test America
Lead	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Magnesium	123	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Mercury	997071	Report #	3E-05	EPA 245.1	8/1/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.023	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	45.4	ppm	0.1	EPA 300.0	7/28/2017		<input type="checkbox"/>
Potassium	19.9	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Selenium	0.463	ppm	0.01	EPA 200.7	8/14/2017		<input type="checkbox"/>
Silver	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sodium	2600	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sulfate	6880	ppm	0.5	EPA 300.0	7/28/2017		<input type="checkbox"/>
Sulfide	< 0.1	ppm	0.1	SM 4500 S2- G	8/3/2017	JDM	<input type="checkbox"/>
Thallium	< 0.2	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Total Organic Carbon	3881001	Report #	1	SM5310B	8/2/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
Vanadium	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Zinc	0.029	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>



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Client:
Stratus Companies

Date Sampled: 7/27/2017 12:00:00 PM
Date Received: 7/27/2017
Batch No: 2456904
Laboratory ID: S172091532
Matrix: Wastewater Grab
Sample Name: MW-4

Attn: Dave Stewart

See Test America Report 280-99707-1 pg 5 of 20.

8260B:

1,1-Dichloroethane: 2.0 ug/L

2-Butanone (MEK): 3.9 ug/L J value

Acetone: 9.1 ug/L J value

Chloroform: 0.24 ug/L J value

Dichlorodifluoromethane: 0.59 ug/L J value

Trichloroethene: 0.29 ug/L J value

Mercury: 0.037 ug/L

Cyanide, Total: 0.0023 mg/L

See ACZ Report L38810-01 pg 6, of 18

SVOC 8270C:

1,4-Dioxane: 11ug/L

TOC: 41.2 mg/L



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Laboratory Report

Client:
Stratus Companies

Date Sampled: 7/12/2017 2:20:00 PM
Date Received: 7/13/2017
Batch No: 2456682
Laboratory ID: S171941412
Matrix: Wastewater Grab
Sample Name: MW-5

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. VOC 8260 Batch #	993291	Report #	0.001	EPA 8260 B	7/25/2017		<input checked="" type="checkbox"/> Test America
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>
Antimony	<0.03	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>
Arsenic	<0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Barium	0.033	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Beryllium	<0.0005	ppm	0.0005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Bicarbonate	1010	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Cadmium	<0.003	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Calcium	292	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Carbonate	<2	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Chromium	<0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Cobalt	0.012	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Copper	0.027	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Lead	0.025	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Magnesium	103	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>
Mercury	995167	Report #	3E-05	EPA 245.1	7/27/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.022	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	0.978	ppm	0.1	EPA 300.0	7/13/2017		<input type="checkbox"/>
Potassium	9.67	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Selenium	<0.01	ppm	0.01	EPA 200.7	8/14/2017		<input type="checkbox"/>
Silver	<0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sodium	1500	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sulfate	4651	ppm	0.5	EPA 300.0	7/13/2017		<input type="checkbox"/>
Thallium	<0.1	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Vanadium	<0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Zinc	0.178	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>



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Client:
Stratus Companies

Date Sampled: 7/12/2017 2:20:00 PM
Date Received: 7/13/2017
Batch No: 2456682
Laboratory ID: S171941412
Matrix: Wastewater Grab
Sample Name: MW-5

Attn: Dave Stewart

1,2-Dichloroethene, Total: 4.9 ug/L
cis-1,2-Dichloroethene: 4.0 ug/L
Tetrachloroethene: 4.7 ug/L
Tetrahydrofuran: 18 ug/L
trans-1,2-Dichloroethene: 0.89 ug/L
Trichloroethene: 11 ug/L
Vinyl chloride: 1.3 ug/L
See Test America Report 280-99516-7 pg 5 of 34.
Mercury: 0.092 ug/L J value



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Client:
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Attn: Dave Stewart

Date Sampled: 7/19/2017 12:30:00 PM
Date Received: 7/20/2017
Batch No: 2456797
Laboratory ID: S172021125
Matrix: Wastewater Grab
Sample Name: MW-5

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Cyanide, Total	9951616	Report #	0.002	EPA 335.2	8/1/2017		<input checked="" type="checkbox"/> Test America
Sulfide	< 0.1	ppm	0.5	SM 4500 S2- G	7/25/2017	JDM	<input type="checkbox"/>

See Test America Report 280-99516-16 pg 6 of 34.
Cyanide, Total: 0.0022 mg/L J value

Results Approved by:



Project Manager/Lab Manager

Date Reported: 10/5/2017

I certify that these analyses and resulting report(s) were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly analyzed all samples and accurately reported the results.



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Laboratory Report

Client:
Stratus Companies

Date Sampled: 7/10/2017 3:15:00 PM
Date Received: 7/11/2017
Batch No: 2456642
Laboratory ID: S17193115B
Matrix: Wastewater Grab
Sample Name: MW-6

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. VOC 8260 Batch #	991371	Report #	0	EPA 8260 B	7/17/2017		<input checked="" type="checkbox"/> Test America
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>
Antimony	< 0.03	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>
Arsenic	< 0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Barium	0.047	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Beryllium	< 0.0005	ppm	0.0005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Bicarbonate	2236	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Cadmium	< 0.003	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Calcium	457	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Carbonate	< 2	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Chromium	< 0.005	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Cobalt	0.02	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Copper	0.011	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Lead	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Magnesium	95.5	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Mercury	995164	Report #	3E-05	EPA 245.1	7/27/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.022	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	1.03	ppm	0.1	EPA 300.0	7/12/2017		<input type="checkbox"/>
Potassium	16.5	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Selenium	< 0.01	ppm	0.01	EPA 200.7	8/14/2017		<input type="checkbox"/>
Silver	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sodium	930	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sulfate	3000	ppm	0.5	EPA 300.0	7/12/2017		<input type="checkbox"/>
Thallium	< 0.1	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Vanadium	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Zinc	0.334	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>



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 Phone 970-226-5500 ♦ Fax: 970-226-4946

Client:
Stratus Companies

Attn: Dave Stewart

Date Sampled: 7/10/2017 3:15:00 PM
Date Received: 7/11/2017
Batch No: 2456642
Laboratory ID: S17193115B
Matrix: Wastewater Grab
Sample Name: MW-6

See Test America Report 280-99137-1 pg 10 of 43.

8260B:

1,1-Dichloroethane: 0.50 ug/L J value

Acetone: 4.1 ug/L J value

Benzene: 0.37 ug/L

cis-1,2-Dichloroethene: 1.6 ug/L

Dichlorodifluoromethane: 0.81 ug/L J value

Tetrachloroethene: 0.55 ug/L J value

Trichloroethene: 0.60 ug/L J value

See Test America Report 280-99516-4 pg 5 of 34.

Mercury: 1.1 ug/L



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Client:
Stratus Companies

Date Sampled: 7/19/2017 12:40:00 PM
Date Received: 7/20/2017
Batch No: 2456797
Laboratory ID: S17202112B
Matrix: Wastewater Grab
Sample Name: MW-6

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Cyanide, Total	9951612	Report #	0.002	EPA 335.2	8/1/2017		<input checked="" type="checkbox"/> Test America
Sulfide	<0.1	Report #	0	SM 4500 S2- G	7/25/2017	JDM	<input type="checkbox"/>
Total Organic Carbon	3858401	Report #	1	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.

See Test America Report 280-99516-12 pg 6 of 34.
Cyanide, Total: 0.011 mg/L B value-compound found in blank and sample.

See ACZ Report L38584-01 pg. 2 of 18.
TOC: 48.3 mg/L

Results Approved by:



Project Manager/Lab Manager

Date Reported: 10/5/2017

I certify that these analyses and resulting report(s) were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly analyzed all samples and accurately reported the results.



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Client:
Stratus Companies

Date Sampled: 7/11/2017 1:50:00 PM
Date Received: 7/12/2017
Batch No: 2456677
Laboratory ID: S171941354
Matrix: Wastewater Grab
Sample Name: MW-11

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. SVOC 8270	3839101	Report #	10	EPA 8270	7/21/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
. VOC 8260 Batch #	991373	Report #	0.002	EPA 8260 B	7/17/2017		<input checked="" type="checkbox"/> Test America-Irvine
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>
Antimony	< 0.03	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>
Arsenic	< 0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Barium	0.119	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Beryllium	< 0.0005	ppm	0.0005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Bicarbonate	1485	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Cadmium	< 0.003	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Calcium	331	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Carbonate	< 2	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Chromium	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Cobalt	0.021	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Copper	0.016	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Lead	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Magnesium	73.9	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Mercury	9951611	Report #	3E-05	EPA 245.1	7/27/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.024	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	0.589	ppm	0.1	EPA 300.0	7/12/2017		<input type="checkbox"/>
Potassium	24.5	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Selenium	< 0.01	ppm	0.01	EPA 200.7	8/14/2017		<input type="checkbox"/>
Silver	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sodium	320	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sulfate	1227	ppm	0.5	EPA 300.0	7/12/2017		<input type="checkbox"/>
Thallium	< 0.1	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Total Organic Carbon	3839101	Report #	20	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
Vanadium	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Zinc	0.159	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>



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2600 Canton Ct. Suite C Fort Collins, CO 80525
Phone 970-226-5500 ♦ Fax: 970-226-4946

Client:
Stratus Companies

Attn: Dave Stewart

Date Sampled: 7/11/2017 1:50:00 PM
Date Received: 7/12/2017
Batch No: 2456677
Laboratory ID: S171941354
Matrix: Wastewater Grab
Sample Name: MW-11

See Test America Report 280-99137-3 pgs

8260B:

1,2,4-Trimethylbenzene: 0.17 ug/L J value

1,4-Dichlorobenzene: 4.9 ug/L

4-Isopropyltoluene: 0.37 ug/L J value

4-Methyl-2-pentanone (MIBK): 0.98 ug/L J value

Acetone: 25 ug/L

Benzene: 0.24 ug/L J value

Chlorobenzene: 0.49 ug/L J value

Toluene: 0.17 ug/L J value

See Test America Report 280-99516-11 pg. 5 of 34.

Mercury: 0.58 ug/L

See ACZ Lab Report L38391-01 pg 2, 6 and 7, of 18.

SVOC 8270C:

1,4-Dioxane: 12 ug/L

TOC: 29.9 mg/L



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Client:
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Date Sampled: 7/19/2017 1:20:00 PM
Date Received: 7/21/2017
Batch No: 2456797
Laboratory ID: S17202112D
Matrix: Wastewater Grab
Sample Name: MW-11

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Cyanide, Total	9951613	Report #	0.002	EPA 335.2	8/1/2017		<input checked="" type="checkbox"/> Test America
Sulfide	0.69	Dig #	0	SM 4500 S2- G	7/25/2017	JDM	<input type="checkbox"/>
Total Organic Carbon	3858501	Report #	1	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.

See Test America Report 280-99516-13 pg 6 of 34.
Cyanide, Total: 0.024 mg/L B value-compund found in blank and sample.

See ACZ Report: L38585-01 pg 2 of 8.
Carbon, Total Organic: 35.0 mg/L



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Client:
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Date Sampled: 7/11/2017 3:20:00 PM
Date Received: 7/12/2017
Batch No: 2456677
Laboratory ID: S17194135A
Matrix: Wastewater Grab
Sample Name: MW-12

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. SVOC 8270	3839001	Report #	10	EPA 8270	7/21/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
. VOC 8260 Batch #	991375	Report #	0.003	EPA 8260 B	7/17/2017		<input checked="" type="checkbox"/> Test America
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>
Antimony	< 0.03	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>
Arsenic	< 0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Barium	0.251	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Beryllium	< 0.0005	ppm	0.0005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Bicarbonate	3264	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Cadmium	< 0.003	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Calcium	349	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Carbonate	< 2	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Chromium	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Cobalt	0.061	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Copper	0.006	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Lead	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Magnesium	92.9	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Mercury	995168	Report #	3E-05	EPA 245.1	7/27/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.08	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	2.15	ppm	0.1	EPA 300.0	7/12/2017		<input type="checkbox"/>
Potassium	33.3	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Selenium	< 0.01	ppm	0.01	EPA 200.7	8/14/2017		<input type="checkbox"/>
Silver	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sodium	790	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sulfate	720	ppm	0.5	EPA 300.0	7/12/2017		<input type="checkbox"/>
Thallium	< 0.1	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Total Organic Carbon	3839001	Report #	20	SM5310B	8/1/2017		<input checked="" type="checkbox"/>
Vanadium	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Zinc	0.216	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>



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Date Sampled: 7/11/2017 3:20:00 PM
Date Received: 7/12/2017
Batch No: 2456677
Laboratory ID: S17194135A
Matrix: Wastewater Grab
Sample Name: MW-12

Attn: Dave Stewart

See Test America Report 280-99137-5 pgs 16 and 17.

8260B:

1,1-Dichloroethane: 8.2 ug/L
1,1-Dichloroethene: 0.51 ug/L J value
1,2,4-Trimethylbenzene: 1.8 ug/L J value
1,2-Dichloroethene, Total: 7.9 ug/L
1,3,5-Trimethylbenzene: 0.63 ug/L
1,4-Dichlorobenzene: 1.3 ug/L J value
4-Isopropyltoluene: 0.68 ug/L J value
Acetone: 23 ug/L
Benzene: 1.8 ug/L
cis-1,2-Dichloroethene: 7.9 ug/L
Ethylbenzene: 2.0 ug/L
Isopropylbenzene: 0.75 ug/L J value
m-Xylene & p-xylene: 1.6 ug/L J value
Naphthalene: 2.7 ug/L
N-Propylbenzene: 0.63 ug/L J value
o-Xylene: 2.2 ug/L
Tetrahydrofuran: 61 ug/L
Toluene: 5.9 ug/L
Trichloroethene: 10 ug/L
Vinyl chloride: 21 ug/L
Xylenes, Total: 3.8 ug/L

See Test America Report 280-99516-8 pg 5 of 34.

Mercury: 2.6 ug/L

See ACZ Report L38390-01 pgs. 2, 6 and 7 , of 18.

SVOC 8270C:

1,4-Dioxane: 64 ug/L

TOC: 87.3 mg/L



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Client:
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Attn: Dave Stewart

Date Sampled: 7/19/2017 1:00:00 PM
Date Received: 7/20/2017
Batch No: 2456797
Laboratory ID: S17202112C
Matrix: Wastewater Grab
Sample Name: MW-12

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Cyanide, Total	9951614	Report #	0.002	EPA 335.2	8/1/2017		<input checked="" type="checkbox"/> Test America
Sulfide	1.39	Dig #	0	SM 4500 S2- G	7/25/2017	JDM	<input type="checkbox"/>
Total Organic Carbon	3858301	Report #	1	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.

See Test America Report 280-99516-14 pg 6 of 34.
Cyanide, Total: 0.035 mg/L B value-compound found in blank and sample.

See ACZ Report L38583-01 pg 2 of 8.

TOC: 63.3 mg/L

Results Approved by:



Project Manager/Lab Manager

Date Reported: 10/5/2017

I certify that these analyses and resulting report(s) were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly analyzed all samples and accurately reported the results.



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Laboratory Report

Client:
Stratus Companies

Date Sampled: 7/12/2017 10:00:00 AM
Date Received: 7/13/2017
Batch No: 2456682
Laboratory ID: S171941421
Matrix: Wastewater Grab
Sample Name: MW-13

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. SVOC 8270	3845801	Report #	10	EPA 8270	7/24/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>
Antimony	< 0.03	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>
Arsenic	< 0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Barium	0.056	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Beryllium	0.0008	ppm	0.0005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Bicarbonate	1882	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Cadmium	< 0.003	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Calcium	480	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Carbonate	< 2	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Chromium	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Cobalt	0.007	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Copper	0.014	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Lead	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Magnesium	129	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Mercury	995169	Report #	3E-05	EPA 245.1	7/27/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.028	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	1.74	ppm	0.1	EPA 300.0	7/13/2017		<input type="checkbox"/>
Potassium	28.9	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Selenium	< 0.01	ppm	0.01	EPA 200.7	8/14/2017		<input type="checkbox"/>
Silver	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sodium	2200	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sulfate	7572	ppm	0.5	EPA 300.0	7/13/2017		<input type="checkbox"/>
Thallium	< 0.1	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Total Organic Carbon	3845801	Report #	1	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
Vanadium	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Zinc	0.068	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>



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Client:
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Date Sampled: 7/12/2017 10:00:00 AM
Date Received: 7/13/2017
Batch No: 2456682
Laboratory ID: S171941421
Matrix: Wastewater Grab
Sample Name: MW-13

Attn: Dave Stewart

See Test America Report 280-99516-9 pg 5 of 34.
Mercury: 0.043 ug/L J value

See ACZ Report L387458-01 pg 2, 6 and 7, of 18.

SVOC 8270C: 1,4-Dioxane: 41 ug/L
TOC: 38.4 mg/L



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Client:
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Date Sampled: 7/20/2017 4:00:00 PM
Date Received: 7/20/2017
Batch No: 2456797
Laboratory ID: S17202112K
Matrix: Wastewater Grab
Sample Name: MW-13

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. VOC 8260 Batch #	9951620	Report #	0	EPA 8260 B	8/2/2017		<input checked="" type="checkbox"/> Test America
Sulfide	< 0.1	ppm	0.1	SM 4500 S2- G	7/25/2017	JDM	<input type="checkbox"/>

See Test America Report 280-99516-20 pg 6 of 34.

8260B:

1,1-Dichloroethane: 17 ug/L J value

1,1-Dichloroethene: 240 ug/L

Acetone: 110 ug/L J value

Freon 113: 200 ug/L

Methylene Chloride: 26 ug/L J value B value

Tetrahydrofuran: 99 ug/L J value

Trichloroethene: 1500 ug/L



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Client:
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Attn: Dave Stewart

Date Sampled: 7/25/2017 5:00:00 PM
Date Received: 7/25/2017
Batch No: 2456863
Laboratory ID: S172081601
Matrix: Wastewater Grab
Sample Name: MW-13

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Cyanide, Total	997072	Report #	0.002	EPA 335.2	8/5/2017		<input checked="" type="checkbox"/> Test America

See Test America Report 280-99707-2 pg 5 of 20.
Cyanide, Total: 0.0039 mg/L J value

Results Approved by:



Project Manager/Lab Manager

Date Reported: 10/5/2017

I certify that these analyses and resulting report(s) were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly analyzed all samples and accurately reported the results.



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MW/15

Time

check 8260 Results
different on this and 3rd page

Laboratory Report

Date Sampled: 7/10/2017 8:45:00 AM
Date Received: 7/11/2017
Batch No: 2456642
Laboratory ID: S17193115C
Matrix: Wastewater Grab
Sample Name: MW-15

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>
Antimony	<0.03	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>
Arsenic	<0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Barium	0.084	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Beryllium	<0.0005	ppm	0.0005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Bicarbonate	1595	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Cadmium	<0.003	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Calcium	427	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Carbonate	<2	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Chromium	<0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Cobalt	0.014	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Copper	0.023	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Lead	<0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Magnesium	127	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Mercury	995165	Report #	3E-05	EPA 245.1	7/27/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.024	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	7.83	ppm	0.1	EPA 300.0	7/12/2017		<input type="checkbox"/>
Potassium	25.7	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Selenium	0.065	ppm	0.01	EPA 200.7	8/16/2017		<input type="checkbox"/>
Silver	<0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sodium	1900	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sulfate	5959	ppm	0.5	EPA 300.0	7/12/2017		<input type="checkbox"/>
Thallium	<0.1	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Vanadium	0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Zinc	0.053	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>

See Test America Report 280-99137-2 pg 12 and 13 of 43.

8260B:

4-Methyl-2-pentanone (MIBK): 1.9 ug/L J value

Acetone: 42 ug/L

See Test America Report 280-99516-5 pg 5 of 34.

Mercury: 1.0 ug/L



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Client:
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Date Sampled: 7/12/2017 12:40:00 PM
Date Received: 7/13/2017
Batch No: 2456682
Laboratory ID: S171941423
Matrix: Wastewater Grab
Sample Name: MW-15

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. SVOC 8270	3841801	Report #	10	EPA 8270	7/21/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
Total Organic Carbon	3841801	Report #	20	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.

See ACZ Report L38418-01 pg. 2, 6 and 7, of 18.

SVOC 8270: ND
TOC: 141 mg/L



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Client:
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Date Sampled: 7/17/2017 1:00:00 PM
Date Received: 7/18/2017
Batch No: 2456753
Laboratory ID: S171991737
Matrix: Wastewater Grab
Sample Name: MW-15

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. VOC 8260 Batch #	993294	Report #	0.01	EPA 8260 B	7/25/2017		<input checked="" type="checkbox"/> Test America
Cyanide, Total	993294	Report #	0.02	EPA 335.2	7/25/2017		<input checked="" type="checkbox"/> Test America
Total Organic Carbon	3858601	Report #	1	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.

See Test America Report # 280-99329-4 pg. 6 of 31.

VOC 8260: Acetone: 26 ug/L

See ACZ Report L38586-01 pg 2 of 8.

TOC: 151 mg/L

Cyanide, Total: 0.0040 mg/L J value-result less than RL but greater than or equal to the MDL-approximate value. B value- compound was found in the blank and the sample.



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Client:
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Attn: Dave Stewart

Date Sampled: 7/20/2017 2:30:00 PM
Date Received: 7/21/2017
Batch No: 2456797
Laboratory ID: S17202112G
Matrix: Wastewater Grab
Sample Name: MW-15

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Cyanide, Total	9951617	Report #	0.002	EPA 335.2	8/1/2017		<input checked="" type="checkbox"/> Test America
Sulfide	<0.1	ppm	0.1	SM 4500 S2- G	7/25/2017	JDM	<input type="checkbox"/>

See Test America Report 280-99516-17 pg 6 of 34.
Cyanide, Total: <0.0020 mg/L



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Laboratory Report

Client:
Stratus Companies

Date Sampled: 7/6/2017 1:30:00 PM
Date Received: 7/6/2017
Batch No: 2456586
Laboratory ID: S171881038
Matrix: Wastewater Grab
Sample Name: M.W. 16

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. VOC 8260 Batch #	991377	Report #	0.1	EPA 8260 B	7/17/2017		<input checked="" type="checkbox"/> Test America
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>
Antimony	< 0.03	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>
Arsenic	0.072	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Barium	0.189	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Beryllium	0.01	ppm	0.0005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Bicarbonate	1135	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Cadmium	0.006	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Calcium	407	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Carbonate	< 2	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Chromium	0.021	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Cobalt	0.058	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Copper	0.113	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Lead	0.054	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Magnesium	118	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>
Mercury	995166	Report #	3E-05	EPA 245.1	7/27/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.132	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	4.91	ppm	0.1	EPA 300.0	7/8/2017		<input type="checkbox"/>
Potassium	23.6	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Selenium	0.029	ppm	0.01	EPA 200.7	8/16/2017		<input type="checkbox"/>
Silver	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sodium	1300	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sulfate	4462	ppm	0.5	EPA 300.0	7/8/2017		<input type="checkbox"/>
Thallium	< 0.1	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Vanadium	0.082	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Zinc	0.275	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>



Stewart Labs LLC

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Client:
Stratus Companies

Date Sampled: 7/6/2017 1:30:00 PM
Date Received: 7/6/2017
Batch No: 2456586
Laboratory ID: S171881038
Matrix: Wastewater Grab
Sample Name: M.W. 16

Attn: Dave Stewart

See Test America Report 280-99137-1 pg 20 & 21 of 43

1,2-Dichloroethene, Total: 1900 ug/L

cis-1,2-Dichloroethene: 1900 ug/L

Dichlorodifluoromethane: 70 ug/L

Tetrahydrofuran: 530 ug/L J value

trans-1,2-Dichloroethene 33 ug/L J value

Trichloroethene: 3200 ug/L

Vinyl chloride: 300 ug/L

See Test America Report 280-99516-6 pg 5 of 34.

Mercury: 1.1 ug/L



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Client:
Stratus Companies

Date Sampled: 7/12/2017 1:40:00 PM
Date Received: 7/12/2017
Batch No: 2456682
Laboratory ID: S171941422
Matrix: Wastewater Grab
Sample Name: MW-16

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. SVOC 8270	3841901	Report #	0.002	EPA 8270	7/24/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
Total Organic Carbon	3841901	Report #	20	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.

See ACZ Report L38419-01 pgs. 2, 6 and 7 of 18.

Total Organic Carbon: <20 mg/L

SVOC:

1,4-Dioxane: 35 ug/L

Benzo(g,h,i)perylene: 23 ug/L

Bis (2-ethylhexyl) phthalate: 6 ug/L

Di-n-octyl phthalate: 5 ug/L

Indeno(1,2,3-cd)pyrene: 10 ug/L



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Client:
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Attn: Dave Stewart

Date Sampled: 7/17/2017 1:30:00 PM
Date Received: 7/18/2017
Batch No: 2456753
Laboratory ID: S17199173A
Matrix: Wastewater Grab
Sample Name: MW-16

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Cyanide, Total	993293	Report #	0.2	EPA 335.2	7/25/2017		<input checked="" type="checkbox"/> Test America
Total Organic Carbon	3858701	Report #	1	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.

See Test America Report # 280-99329-3 pg. 6 of 31.

Cyanide, Total: 0.0046 mg/L J value-result less than RL but greater than or equal to the MDL-approximate value. B value- compound was found in the blank and the sample.

See ACZ Report L38587-01 pg. 2 of 18.

TOC: 1.0 mg/L



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Client:
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Attn: Dave Stewart

Date Sampled: 7/20/2017 2:45:00 PM
Date Received: 7/21/2017
Batch No: 2456797
Laboratory ID: S17202112H
Matrix: Wastewater Grab
Sample Name: MW-16

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
Sulfide	< 0.1	ppm	0.1	SM 4500 S2- G	7/25/2017	JDM	<input type="checkbox"/>

Results Approved by:



Project Manager/Lab Manager

Date Reported: 10/5/2017

I certify that these analyses and resulting report(s) were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly analyzed all samples and accurately reported the results.



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Client:
Stratus Companies

Attn: Dave Stewart

Date Sampled: 7/27/2017 4:30:00 PM
Date Received: 7/31/2017
Batch No: 2456920
Laboratory ID: S172121254
Matrix: Wastewater Grab
Sample Name: MW-19

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. VOC 8260 Batch #	997761	Report #	0.0002	EPA 8260 B	8/10/2017		<input checked="" type="checkbox"/> Test America
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>
Antimony	<0.03	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Arsenic	<0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Barium	0.025	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Beryllium	<0.0005	ppm	0.0005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Bicarbonate	778	ppm	2	SM 2320 B	7/31/2017		<input type="checkbox"/>
Cadmium	<0.003	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>
Calcium	213	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Carbonate	<2	ppm	2	SM 2320 B	7/31/2017		<input type="checkbox"/>
Chromium	<0.005	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Cobalt	<0.002	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Copper	0.009	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Cyanide, Total	997761	Report #	0.002	EPA 335.2	8/9/2017		<input checked="" type="checkbox"/> Test America
Lead	<0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Magnesium	56	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>
Mercury	997761	Report #	3E-05	EPA 245.1	8/2/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.004	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	4.62	ppm	0.1	EPA 300.0	7/28/2017		<input type="checkbox"/>
Potassium	17	ppm	0.1	EPA 200.7	8/16/2017		<input type="checkbox"/>
Selenium	0.106	ppm	0.01	EPA 200.7	8/16/2017		<input type="checkbox"/>
Silver	<0.005	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Sodium	500	ppm	0.1	EPA 200.7	8/16/2017		<input type="checkbox"/>
Sulfate	9155	ppm	0.5	EPA 300.0	7/28/2017		<input type="checkbox"/>
Sulfide	<0.1	ppm	0.1	SM 4500 S2- G	8/3/2017	JDM	<input type="checkbox"/>
Thallium	<0.1	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Vanadium	<0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Zinc	0.283	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>

See Test america Report 280-99776-1 pg 6 of 21.
8260B:
Chloroform: 0.60 ug/L J value
Methylene Chloride: 0.89 ug/L J value, B value
Cyanide, Total: 0.0026 mg/L J value
Mercury: <0.027 ug/L



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Client:
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Attn: Dave Stewart

Date Sampled: 7/27/2017 10:00:00 AM
Date Received: 7/27/2017
Batch No: 2456904
Laboratory ID: S172091522
Matrix: Wastewater Grab
Sample Name: MW-19

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. SVOC 8270	3880901	Report #	10	EPA 8270	8/16/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
Total Organic Carbon	3880901	Report #	1	SM5310B	8/2/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.

See ACZ Report L38809-01 pg 6 and 2 of 18.

SVOC 8270: ND
TOC: 6.7 mg/L



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Client:
Stratus Companies

Attn: Dave Stewart

Date Sampled: 7/27/2017 4:30:00 PM
Date Received: 7/31/2017
Batch No: 2456920
Laboratory ID: S172121254
Matrix: Wastewater Grab
Sample Name: MW-19

Results Approved by:



Project Manager/Lab Manager

Date Reported: 10/5/2017

I certify that these analyses and resulting report(s) were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly analyzed all samples and accurately reported the results.



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Laboratory Report

Client:
Stratus Companies

Date Sampled: 7/13/2017 2:20:00 PM
Date Received: 7/14/2017
Batch No: 2456690
Laboratory ID: S171981254
Matrix: Wastewater Grab
Sample Name: MW-20

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. SVOC 8270	3845701	Report #	10	EPA 8270	7/24/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	8/1/2017		<input type="checkbox"/>
Antimony	< 0.03	ppm	0.03	EPA 200.7	8/14/2017		<input type="checkbox"/>
Arsenic	< 0.02	ppm	0.02	EPA 200.7	8/16/2017		<input type="checkbox"/>
Barium	0.059	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Beryllium	< 0.0005	ppm	0.0005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Bicarbonate	738	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Cadmium	< 0.003	ppm	0.003	EPA 200.7	8/14/2017		<input type="checkbox"/>
Calcium	408	ppm	0.03	EPA 200.7	8/16/2017		<input type="checkbox"/>
Carbonate	< 2	ppm	2	SM 2320 B	7/19/2017		<input type="checkbox"/>
Chromium	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Cobalt	0.002	ppm	0.002	EPA 200.7	8/14/2017		<input type="checkbox"/>
Copper	0.011	ppm	0.005	EPA 200.7	8/16/2017		<input type="checkbox"/>
Lead	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Magnesium	80.4	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>
Mercury	9951610	Report #	3E-05	EPA 245.1	7/27/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	2.55	ppm	0.1	EPA 300.0	7/13/2017		<input type="checkbox"/>
Potassium	24.6	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Selenium	0.109	ppm	0.01	EPA 200.7	8/16/2017		<input type="checkbox"/>
Silver	< 0.005	ppm	0.005	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sodium	920	ppm	0.1	EPA 200.7	8/14/2017		<input type="checkbox"/>
Sulfate	3907	ppm	0.5	EPA 300.0	7/13/2017		<input type="checkbox"/>
Thallium	< 0.1	ppm	0.002	EPA 200.7	8/16/2017		<input type="checkbox"/>
Total Organic Carbon	3845701	Report #	1	SM5310B	8/1/2017		<input checked="" type="checkbox"/> ACZ Laboratories, Inc.
Vanadium	< 0.02	ppm	0.02	EPA 200.7	8/14/2017		<input type="checkbox"/>
Zinc	0.075	ppm	0.003	EPA 200.7	8/16/2017		<input type="checkbox"/>



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Date Sampled: 7/13/2017 2:20:00 PM
Date Received: 7/14/2017
Batch No: 2456690
Laboratory ID: S171981254
Matrix: Wastewater Grab
Sample Name: MW-20

Attn: Dave Stewart

See Test America Report 208-99516-10 pg 5 of 34.
Mercury: <0.027 ug/L

See ACZ Report L38457-01 pgs. 2, 6 and 7, of 18.

SVOC 8270C:

Benzo(g,h,i)perylene: 3 ug/L (J value-analyte concentration detected at a value between MDL and PQL)

Benzoic Acid: 20 ug/L (J value-analyte concentration detected at a value between MDL and PQL)

TOC: 15.9 mg/L



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Client:
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Date Sampled: 7/20/2017 1:10:00 PM
Date Received: 7/21/2017
Batch No: 2456797
Laboratory ID: S17202112E
Matrix: Wastewater Grab
Sample Name: MW-20

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. VOC 8260 Batch #	9951618	Report #	0	EPA 8260 B	8/2/2017		<input checked="" type="checkbox"/> Test America
Cyanide, Total	9951618	Report #	0.002	EPA 335.2	8/1/2017		<input checked="" type="checkbox"/> Test America
Sulfide	<0.1	Report #	10	SM 4500 S2- G	7/25/2017	JDM	<input checked="" type="checkbox"/>

See Test America Report 280-99516-18 pg 6 of 34.

8260B:

Acetone: 28 ug/L

o-Xylene: 0.23 ug/L J value

Toluene: 0.17 ug/L J value

Xylenes, Total: 0.23 ug/L J value

Cyanide, Total: <0.0020 mg/L



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Laboratory Report

Client:
Stratus Companies

Date Sampled: 8/23/2017 3:00:00 PM
Date Received: 8/24/2017
Batch No: 2457180
Laboratory ID: S172361624
Matrix: Wastewater Grab
Sample Name: Q-M.W.-12

Attn: Dave Stewart

Analysis	Results	Units	MDL	Method	Analysis Date	Analyst	Sent Out Laboratory
. SVOC 8270	1005682	Report #	10	EPA 8270	8/30/2017		<input checked="" type="checkbox"/> Test America
. VOC 8260 Batch #	1005682	Report #	0	EPA 8260 B	9/6/2017		<input checked="" type="checkbox"/> Test America
_Digest/Total Rec. Batch #	11	Dig #	0	SM 3005 A	9/18/2017		<input type="checkbox"/>
Antimony	< 0.03	ppm	0.03	EPA 200.7	9/18/2017		<input type="checkbox"/>
Arsenic	< 0.02	ppm	0.02	EPA 200.7	9/18/2017		<input type="checkbox"/>
Barium	0.08	ppm	0.002	EPA 200.7	9/18/2017		<input type="checkbox"/>
Beryllium	0.0006	ppm	0.0005	EPA 200.7	9/18/2017		<input type="checkbox"/>
Bicarbonate	1293	ppm	2	SM 2320 B	8/25/2017		<input type="checkbox"/>
Cadmium	< 0.003	ppm	0.003	EPA 200.7	9/18/2017		<input type="checkbox"/>
Calcium	391	ppm	0.03	EPA 200.7	9/18/2017		<input type="checkbox"/>
Carbonate	< 2	ppm	2	SM 2320 B	8/25/2017		<input type="checkbox"/>
Chromium	0.093	ppm	0.005	EPA 200.7	9/18/2017		<input type="checkbox"/>
Cobalt	0.02	ppm	0.002	EPA 200.7	9/18/2017		<input type="checkbox"/>
Copper	0.067	ppm	0.005	EPA 200.7	9/18/2017		<input type="checkbox"/>
Cyanide, Total	1005682	Report #	0.002	EPA 335.2	8/31/2017		<input checked="" type="checkbox"/> Test America
Lead	< 0.02	ppm	0.02	EPA 200.7	9/18/2017		<input type="checkbox"/>
Magnesium	121	ppm	0.003	EPA 200.7	9/18/2017		<input type="checkbox"/>
Mercury	1005682	Report #	3E-05	EPA 245.1	8/28/2017		<input checked="" type="checkbox"/> Test America
Nickel	0.026	ppm	0.005	EPA 200.7	9/18/2017		<input type="checkbox"/>
Nitrate + Nitrite as N	33.9	ppm	0.1	EPA 300.0	8/24/2017		<input type="checkbox"/>
Nitrogen, Total Kjeldahl as N	1005682	Report #	0.005	SM 4500 Norg B	8/30/2017		<input checked="" type="checkbox"/> Test America
Phenols	1005682	Report #	0.007	SM 5530 D	8/30/2017		<input checked="" type="checkbox"/> Test America
Phosphorus/Total	1005682	Report #	0.005	SM 4500 P E	8/29/2017		<input checked="" type="checkbox"/> Test America
Potassium	24.6	ppm	0.1	EPA 200.7	9/18/2017		<input type="checkbox"/>
Selenium	0.049	ppm	0.01	EPA 200.7	9/18/2017		<input type="checkbox"/>
Silver	< 0.005	ppm	0.005	EPA 200.7	9/18/2017		<input type="checkbox"/>
Sodium	2100	ppm	0.1	EPA 200.7	9/18/2017		<input type="checkbox"/>
Sulfate	6180	ppm	0.5	EPA 300.0	8/24/2017		<input type="checkbox"/>
Sulfide	< 0.1	ppm	0.1	SM 4500 S2- G	9/11/2017	JDM	<input type="checkbox"/>
Thallium	< 0.2	ppm	0.002	EPA 200.7	9/18/2017		<input type="checkbox"/>
Total Organic Carbon	1005682	Report #	0.16	SM5310B	9/18/2017		<input checked="" type="checkbox"/> Test America
Vanadium	0.021	ppm	0.02	EPA 200.7	9/18/2017		<input type="checkbox"/>



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Client:
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Attn: Dave Stewart

Date Sampled: 8/23/2017 3:00:00 PM
Date Received: 8/24/2017
Batch No: 2457180
Laboratory ID: S172361624
Matrix: Wastewater Grab
Sample Name: Q-M.W.-12

Zinc 0.169 ppm 0.003 EPA 200.7 9/18/2017 ☐

See Test America Report 280-100568-2 pg 6 of 30.

SVOC 8270C:

Diethyl phthalate: 0.37 ug/L J value--result less than RL but greater than or equal to MDL-approximate value)

VOC 8260B: ND

Cyanide, Total: 0.014 mg/L B value-compound was found in the blank sample

TKN: 0.55 mg/L J value

Mercury 245.1: 0.060 ug/L J value

Phosphorus, Total: 0.20 mg/L B value

Phenolics, Total Recoverable: < 0.0068 mg/L

TOC: 20 mg/L

Sulfide ran 12 days out of hold time.

Results Approved by:



Project Manager/Lab Manager

Date Reported: 10/17/2017

I certify that these analyses and resulting report(s) were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly analyzed all samples and accurately reported the results.



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Laboratory Quality Control Report

Anions EPA 300.0	
Date of Analysis	7/8/2017

Blank		
Analyte	Tested Value (ppm)	QC Acceptance Limit (ppm)
Bromide	ND	< 0.5
Chloride	ND	< 0.5
Fluoride	ND	< 0.1
Nitrate as N	ND	< 0.1
Nitrite as N	ND	< 0.1
Phosphate as P	ND	< 0.5
Sulfate	ND	< 0.5

Independent Reference Material - Quality Control Sample				
Analyte	Spike Amount (ppm)	Observed Amt (ppm)	Recovery	Acceptance Limit
Bromide	1.00	1.38	138%	80% to 120%
Chloride	2.00	2.33	117%	80% to 120%
Fluoride	1.00	1.18	118%	80% to 120%
Nitrate as N	2.00	2.06	103%	80% to 120%
Nitrite as N	1.00	1.12	112%	80% to 120%
Phosphate as P	3.00	2.97	99%	80% to 120%
Sulfate	4.00	3.95	99%	80% to 120%

Blank Spike				
Analyte	Ref. Value (ppm)	Recovery	Acceptance Limit	
Bromide	1.00	0.93	93%	80% to 120%
Chloride	1.00	0.90	90%	80% to 120%
Fluoride	1.00	0.99	99%	80% to 120%
Nitrate as N	1.00	0.90	90%	80% to 120%
Nitrite as N	1.00	0.83	83%	80% to 120%
Phosphate as P	1.00	0.95	95%	80% to 120%
Sulfate	1.00	0.87	87%	80% to 120%

Blank Spike Duplicate				
Analyte	Tested Values (ppm)		Deviation	Acceptance Limit
Bromide	0.93	1.09	16%	< 20%
Chloride	0.90	0.99	9%	< 20%
Fluoride	0.99	1.09	10%	< 20%
Nitrate as N	0.90	0.91	1%	< 20%
Nitrite as N	0.83	0.88	5%	< 20%
Phosphate as P	0.95	0.98	2%	< 20%
Sulfate	0.87	0.89	2%	< 20%

ND - Not detected.

Laboratory Quality Control Report

Anions EPA 300.0	
Date of Analysis	7/12/17

Blank		
Analyte	Tested Value (ppm)	QC Acceptance Limit (ppm)
Bromide	ND	< 0.5
Chloride	ND	< 0.5
Fluoride	ND	< 0.1
Nitrate as N	ND	< 0.1
Nitrite as N	ND	< 0.1
Phosphate as P	ND	< 0.5
Sulfate	ND	< 0.5

Independent Reference Material - Quality Control Sample				
Analyte	Spike Amount (ppm)	Observed Amt (ppm)	Recovery	Acceptance Limit
Bromide	1.00	1.34	134%	80% to 120%
Chloride	2.00	2.03	102%	80% to 120%
Fluoride	1.00	1.10	110%	80% to 120%
Nitrate as N	2.00	2.05	103%	80% to 120%
Nitrite as N	1.00	1.09	109%	80% to 120%
Phosphate as P	3.00	2.92	97%	80% to 120%
Sulfate	4.00	3.91	98%	80% to 120%

Blank Spike				
Analyte	Ref. Value (ppm)	Recovery	Acceptance Limit	
Bromide	1.00	1.13	113%	80% to 120%
Chloride	1.00	1.00	100%	80% to 120%
Fluoride	1.00	1.08	108%	80% to 120%
Nitrate as N	1.00	0.90	90%	80% to 120%
Nitrite as N	1.00	0.90	90%	80% to 120%
Phosphate as P	1.00	0.86	86%	80% to 120%
Sulfate	1.00	0.95	95%	80% to 120%

Blank Spike Duplicate				
Analyte	Tested Values (ppm)		Deviation	Acceptance Limit
Bromide	1.13	1.13	0%	< 20%
Chloride	1.00	0.98	3%	< 20%
Fluoride	1.08	1.06	2%	< 20%
Nitrate as N	0.90	0.94	4%	< 20%
Nitrite as N	0.90	0.91	1%	< 20%
Phosphate as P	0.86	0.92	6%	< 20%
Sulfate	0.95	0.90	6%	< 20%

ND - Not detected.

Laboratory Quality Control Report

Anions EPA 300.0	
Date of Analysis	7/13/17

Blank		
Analyte	Tested Value (ppm)	QC Acceptance Limit (ppm)
Bromide	ND	< 0.5
Chloride	ND	< 0.5
Fluoride	ND	< 0.1
Nitrate as N	ND	< 0.1
Nitrite as N	ND	< 0.1
Phosphate as P	ND	< 0.5
Sulfate	ND	< 0.5

Independent Reference Material - Quality Control Sample				
Analyte	Spike Amount (ppm)	Observed Amt (ppm)	Recovery	Acceptance Limit
Bromide	1.00	1.18	118%	80% to 120%
Chloride	2.00	1.97	99%	80% to 120%
Fluoride	1.00	1.08	108%	80% to 120%
Nitrate as N	2.00	2.06	103%	80% to 120%
Nitrite as N	1.00	1.10	110%	80% to 120%
Phosphate as P	3.00	2.88	96%	80% to 120%
Sulfate	4.00	4.18	105%	80% to 120%

Blank Spike				
Analyte	Ref. Value (ppm)	Recovery	Acceptance Limit	
Bromide	1.00	1.04	104%	80% to 120%
Chloride	1.00	0.99	99%	80% to 120%
Fluoride	1.00	1.04	104%	80% to 120%
Nitrate as N	1.00	1.00	100%	80% to 120%
Nitrite as N	1.00	0.87	87%	80% to 120%
Phosphate as P	1.00	0.89	89%	80% to 120%
Sulfate	1.00	0.87	87%	80% to 120%

Blank Spike Duplicate				
Analyte	Tested Values (ppm)		Deviation	Acceptance Limit
Bromide	1.04	1.21	15%	< 20%
Chloride	0.99	1.06	7%	< 20%
Fluoride	1.04	1.06	2%	< 20%
Nitrate as N	1.00	1.06	6%	< 20%
Nitrite as N	0.87	1.00	14%	< 20%
Phosphate as P	0.89	1.01	13%	< 20%
Sulfate	0.87	1.07	21%	< 20%

ND - Not detected.

Laboratory Quality Control Report

Anions EPA 300.0	
Date of Analysis	7/19/17

Blank		
Analyte	Tested Value (ppm)	QC Acceptance Limit (ppm)
Bromide	ND	< 0.5
Chloride	ND	< 0.5
Fluoride	ND	< 0.1
Nitrate as N	ND	< 0.1
Nitrite as N	ND	< 0.1
Phosphate as P	ND	< 0.5
Sulfate	ND	< 0.5

Independent Reference Material - Quality Control Sample				
Analyte	Spike Amount (ppm)	Observed Amt (ppm)	Recovery	Acceptance Limit
Bromide	1.00	1.05	105%	80% to 120%
Chloride	2.00	1.84	92%	80% to 120%
Fluoride	1.00	1.03	103%	80% to 120%
Nitrate as N	2.00	1.91	96%	80% to 120%
Nitrite as N	1.00	1.04	104%	80% to 120%
Phosphate as P	3.00	2.52	84%	80% to 120%
Sulfate	4.00	3.92	98%	80% to 120%

Blank Spike				
Analyte	Ref. Value (ppm)	Recovery	Acceptance Limit	
Bromide	1.00	1.14	114%	80% to 120%
Chloride	1.00	1.05	105%	80% to 120%
Fluoride	1.00	1.06	106%	80% to 120%
Nitrate as N	1.00	1.08	108%	80% to 120%
Nitrite as N	1.00	0.93	93%	80% to 120%
Phosphate as P	1.00	0.97	97%	80% to 120%
Sulfate	1.00	0.80	80%	80% to 120%

Blank Spike Duplicate				
Analyte	Tested Values (ppm)		Deviation	Acceptance Limit
Bromide	1.14	1.18	3%	< 20%
Chloride	1.05	1.06	1%	< 20%
Fluoride	1.06	1.08	2%	< 20%
Nitrate as N	1.08	1.09	1%	< 20%
Nitrite as N	0.93	0.94	1%	< 20%
Phosphate as P	0.97	1.00	3%	< 20%
Sulfate	0.80	0.92	14%	< 20%

ND - Not detected.

Laboratory Quality Control Report

Anions EPA 300.0	
Date of Analysis	7/28/17

Blank		
Analyte	Tested Value (ppm)	QC Acceptance Limit (ppm)
Bromide	ND	< 0.5
Chloride	ND	< 0.5
Fluoride	ND	< 0.1
Nitrate as N	ND	< 0.1
Nitrite as N	ND	< 0.1
Phosphate as P	ND	< 0.5
Sulfate	ND	< 0.5

Independent Reference Material - Quality Control Sample				
Analyte	Spike Amount (ppm)	Observed Amt (ppm)	Recovery	Acceptance Limit
Bromide	1.00	1.06	106%	80% to 120%
Chloride	2.00	1.95	98%	80% to 120%
Fluoride	1.00	1.08	108%	80% to 120%
Nitrate as N	2.00	1.93	97%	80% to 120%
Nitrite as N	1.00	0.97	97%	80% to 120%
Phosphate as P	3.00	2.79	93%	80% to 120%
Sulfate	4.00	3.65	91%	80% to 120%

Blank Spike				
Analyte	Ref. Value (ppm)	Recovery	Acceptance Limit	
Bromide	1.00	1.32	132%	80% to 120%
Chloride	1.00	1.01	101%	80% to 120%
Fluoride	1.00	1.07	107%	80% to 120%
Nitrate as N	1.00	1.03	103%	80% to 120%
Nitrite as N	1.00	0.86	86%	80% to 120%
Phosphate as P	1.00	1.02	102%	80% to 120%
Sulfate	1.00	0.94	94%	80% to 120%

Blank Spike Duplicate				
Analyte	Tested Values (ppm)		Deviation	Acceptance Limit
Bromide	1.32	1.21	9%	< 20%
Chloride	1.01	1.00	1%	< 20%
Fluoride	1.07	1.09	2%	< 20%
Nitrate as N	1.03	1.01	2%	< 20%
Nitrite as N	0.86	0.86	1%	< 20%
Phosphate as P	1.02	0.95	7%	< 20%
Sulfate	0.94	0.90	5%	< 20%

ND - Not detected.

Laboratory Quality Control Report

Anions EPA 300.0	
Date of Analysis	8/24/17

Blank		
Analyte	Tested Value (ppm)	QC Acceptance Limit (ppm)
Bromide	ND	< 0.5
Chloride	ND	< 0.5
Fluoride	ND	< 0.1
Nitrate as N	ND	< 0.1
Nitrite as N	ND	< 0.1
Phosphate as P	ND	< 0.5
Sulfate	ND	< 0.5

Independent Reference Material - Quality Control Sample				
Analyte	Spike Amount (ppm)	Observed Amt (ppm)	Recovery	Acceptance Limit
Bromide	1.00	1.18	118%	80% to 120%
Chloride	2.00	1.87	94%	80% to 120%
Fluoride	1.00	1.08	108%	80% to 120%
Nitrate as N	2.00	2.07	104%	80% to 120%
Nitrite as N	1.00	1.14	114%	80% to 120%
Phosphate as P	3.00	2.90	97%	80% to 120%
Sulfate	4.00	4.29	107%	80% to 120%

Blank Spike				
Analyte	Ref. Value (ppm)	Recovery	Acceptance Limit	
Bromide	1.00	1.21	121%	80% to 120%
Chloride	1.00	1.08	108%	80% to 120%
Fluoride	1.00	1.08	108%	80% to 120%
Nitrate as N	1.00	1.13	113%	80% to 120%
Nitrite as N	1.00	0.99	99%	80% to 120%
Phosphate as P	1.00	1.03	103%	80% to 120%
Sulfate	1.00	0.99	99%	80% to 120%

Blank Spike Duplicate				
Analyte	Tested Values (ppm)		Deviation	Acceptance Limit
Bromide	1.21	1.22	1%	< 20%
Chloride	1.08	1.09	1%	< 20%
Fluoride	1.08	1.09	1%	< 20%
Nitrate as N	1.13	1.14	1%	< 20%
Nitrite as N	0.99	1.01	2%	< 20%
Phosphate as P	1.03	1.05	2%	< 20%
Sulfate	0.99	0.96	2%	< 20%

ND - Not detected.

**Total Metals
EPA 200.7**

Analysis Date	08/14/17
Analysis Batch Number(s)	Digest Batch 11

Digest Blank		
Parameter	Tested Values (ppm)	Acceptance Limit (ppm)
Arsenic	ND	< 0.02
Barium	ND	< 0.001
Cadmium	ND	< 0.003
Calcium	ND	< 0.04
Chromium	ND	< 0.005
Copper	ND	< 0.005
Lead	ND	< 0.02
Manganese	ND	< 0.002
Molybdenum	ND	< 0.02
Nickel	ND	< 0.005
Selenium	ND	< 0.02
Silver	ND	< 0.005
Zinc	ND	< 0.01

Independent Reference Material - Quality Control Sample				
Parameter	Tested Values (ppm)	Reference Value (ppm)	Recovery	Acceptance Limit
Arsenic	0.95	1.00	95%	90% - 110%
Barium	0.95	1.00	95%	90% - 110%
Cadmium	0.91	1.00	91%	90% - 110%
Calcium	0.94	1.00	94%	90% - 110%
Chromium	0.94	1.00	94%	90% - 110%
Copper	0.92	1.00	92%	90% - 110%
Lead	0.96	1.00	96%	90% - 110%
Manganese	0.95	1.00	95%	90% - 110%
Molybdenum	1.08	1.00	108%	90% - 110%
Nickel	0.97	1.00	97%	90% - 110%
Selenium	0.93	1.00	93%	90% - 110%
Silver	1.05	1.00	105%	90% - 110%
Zinc	0.98	1.00	98%	90% - 110%

ND = Not detected

Laboratory Quality Control Report

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Total Metals EPA 200.7

Analysis Date	08/14/17
Analysis Batch Number(s)	Digest Batch 11

Digest Blank Spike

Parameter	Spike Amount (ppm)	Recovered Amt. (ppm)	Recovery	Acceptance Limit
Arsenic	0.40	0.39	98%	80% - 120%
Barium	0.20	0.20	100%	80% - 120%
Cadmium	0.20	0.18	90%	80% - 120%
Calcium	4.0	4.18	105%	80% - 120%
Chromium	0.20	0.19	95%	80% - 120%
Copper	0.20	0.19	95%	80% - 120%
Lead	0.40	0.38	95%	80% - 120%
Manganese	0.20	0.19	95%	80% - 120%
Molybdenum	0.40	0.44	110%	80% - 120%
Nickel	0.20	0.19	95%	80% - 120%
Selenium	0.40	0.37	93%	80% - 120%
Silver	0.40	0.42	105%	80% - 120%
Zinc	0.20	0.20	100%	80% - 120%

Blank Spike Duplicate

Parameter	Tested Values (ppm)		Deviation	Acceptance Limit
Arsenic	0.39	0.39	0%	< 20%
Barium	0.20	0.19	5%	< 20%
Cadmium	0.18	0.18	0%	< 20%
Calcium	4.18	4.19	0%	< 20%
Chromium	0.19	0.19	0%	< 20%
Copper	0.19	0.19	0%	< 20%
Lead	0.38	0.38	0%	< 20%
Manganese	0.19	0.19	0%	< 20%
Molybdenum	0.44	0.45	2%	< 20%
Nickel	0.19	0.19	0%	< 20%
Selenium	0.37	0.37	0%	< 20%
Silver	0.42	0.42	0%	< 20%
Zinc	0.20	0.20	0%	< 20%

**Total Metals
EPA 200.7**

Analysis Date	08/16/17
Analysis Batch Number(s)	Digest Batch 11

Digest Blank		
Parameter	Tested Values (ppm)	Acceptance Limit (ppm)
Arsenic	ND	< 0.02
Barium	ND	< 0.001
Cadmium	ND	< 0.003
Calcium	ND	< 0.04
Chromium	ND	< 0.005
Copper	ND	< 0.005
Lead	ND	< 0.02
Manganese	ND	< 0.002
Molybdenum	ND	< 0.02
Nickel	ND	< 0.005
Selenium	ND	< 0.02
Silver	ND	< 0.005
Zinc	ND	< 0.01

Independent Reference Material - Quality Control Sample				
Parameter	Tested Values (ppm)	Reference Value (ppm)	Recovery	Acceptance Limit
Arsenic	0.95	1.00	95%	90% - 110%
Barium	0.95	1.00	95%	90% - 110%
Cadmium	0.91	1.00	91%	90% - 110%
Calcium	0.94	1.00	94%	90% - 110%
Chromium	0.94	1.00	94%	90% - 110%
Copper	0.92	1.00	92%	90% - 110%
Lead	0.96	1.00	96%	90% - 110%
Manganese	0.95	1.00	95%	90% - 110%
Molybdenum	1.08	1.00	108%	90% - 110%
Nickel	0.97	1.00	97%	90% - 110%
Selenium	0.93	1.00	93%	90% - 110%
Silver	1.05	1.00	105%	90% - 110%
Zinc	0.98	1.00	98%	90% - 110%

ND = Not detected

Laboratory Quality Control Report

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Total Metals EPA 200.7

Analysis Date	08/16/17
Analysis Batch Number(s)	Digest Batch 11

Digest Blank Spike

Parameter	Spike Amount (ppm)	Recovered Amt. (ppm)	Recovery	Acceptance Limit
Arsenic	0.40	0.39	98%	80% - 120%
Barium	0.20	0.20	100%	80% - 120%
Cadmium	0.20	0.18	90%	80% - 120%
Calcium	4.0	4.18	105%	80% - 120%
Chromium	0.20	0.19	95%	80% - 120%
Copper	0.20	0.19	95%	80% - 120%
Lead	0.40	0.38	95%	80% - 120%
Manganese	0.20	0.19	95%	80% - 120%
Molybdenum	0.40	0.44	110%	80% - 120%
Nickel	0.20	0.19	95%	80% - 120%
Selenium	0.40	0.37	93%	80% - 120%
Silver	0.40	0.42	105%	80% - 120%
Zinc	0.20	0.20	100%	80% - 120%

Blank Spike Duplicate

Parameter	Tested Values (ppm)		Deviation	Acceptance Limit
Arsenic	0.39	0.39	0%	< 20%
Barium	0.20	0.19	5%	< 20%
Cadmium	0.18	0.18	0%	< 20%
Calcium	4.18	4.19	0%	< 20%
Chromium	0.19	0.19	0%	< 20%
Copper	0.19	0.19	0%	< 20%
Lead	0.38	0.38	0%	< 20%
Manganese	0.19	0.19	0%	< 20%
Molybdenum	0.44	0.45	2%	< 20%
Nickel	0.19	0.19	0%	< 20%
Selenium	0.37	0.37	0%	< 20%
Silver	0.42	0.42	0%	< 20%
Zinc	0.20	0.20	0%	< 20%

**Total Metals
EPA 200.7**

Analysis Date	09/18/17
Analysis Batch Number(s)	Digest Batch 11

Digest Blank		
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Barium	ND	< 0.001
Cadmium	ND	< 0.003
Calcium	ND	< 0.04
Chromium	ND	< 0.005
Copper	ND	< 0.005
Lead	ND	< 0.02
Manganese	ND	< 0.002
Molybdenum	ND	< 0.02
Nickel	ND	< 0.005
Selenium	ND	< 0.02
Silver	ND	< 0.005
Zinc	ND	< 0.01

Independent Reference Material - Quality Control Sample				
Parameter	Tested Values (ppm)	Reference Value (ppm)	Recovery	Acceptance Limit
Arsenic	0.95	1.00	95%	90% - 110%
Barium	0.95	1.00	95%	90% - 110%
Cadmium	0.91	1.00	91%	90% - 110%
Calcium	0.94	1.00	94%	90% - 110%
Chromium	0.94	1.00	94%	90% - 110%
Copper	0.92	1.00	92%	90% - 110%
Lead	0.96	1.00	96%	90% - 110%
Manganese	0.95	1.00	95%	90% - 110%
Molybdenum	1.08	1.00	108%	90% - 110%
Nickel	0.97	1.00	97%	90% - 110%
Selenium	0.93	1.00	93%	90% - 110%
Silver	1.05	1.00	105%	90% - 110%
Zinc	0.98	1.00	98%	90% - 110%

ND = Not detected

Laboratory Quality Control Report

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Total Metals EPA 200.7

Analysis Date	09/18/17
Analysis Batch Number(s)	Digest Batch 11

Digest Blank Spike

Parameter	Spike Amount (ppm)	Recovered Amt. (ppm)	Recovery	Acceptance Limit
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Calcium	4.0	4.18	105%	80% - 120%
Chromium	0.20	0.19	95%	80% - 120%
Copper	0.20	0.19	95%	80% - 120%
Lead	0.40	0.38	95%	80% - 120%
Manganese	0.20	0.19	95%	80% - 120%
Molybdenum	0.40	0.44	110%	80% - 120%
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Selenium	0.40	0.37	93%	80% - 120%
Silver	0.40	0.42	105%	80% - 120%
Zinc	0.20	0.20	100%	80% - 120%

Blank Spike Duplicate

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Barium	0.20	0.19	5%	< 20%
Cadmium	0.18	0.18	0%	< 20%
Calcium	4.18	4.19	0%	< 20%
Chromium	0.19	0.19	0%	< 20%
Copper	0.19	0.19	0%	< 20%
Lead	0.38	0.38	0%	< 20%
Manganese	0.19	0.19	0%	< 20%
Molybdenum	0.44	0.45	2%	< 20%
Nickel	0.19	0.19	0%	< 20%
Selenium	0.37	0.37	0%	< 20%
Silver	0.42	0.42	0%	< 20%
Zinc	0.20	0.20	0%	< 20%



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